MITSUBISHI ELECTRIC

Mitsubishi Programmable Controller

MELSEC iQ-R series

MELSEC iQ-R Motion Controller Programming Manual (Common)

-R16MTCPU
-R32MTCPU

SAFETY PRECAUTIONS

(Read these precautions before using this product.)

Before using this product, please read this manual and the relevant manuals carefully and pay full attention to safety to handle the product correctly.

The precautions given in this manual are concerned with this product only. Refer to the user's manual of the CPU module to use for a description of the PLC system safety precautions.

In this manual, the safety precautions are classified into two levels: " ⚠ WARNING" and " ⚠ CAUTION".

⚠ **WARNING**	Indicates that incorrect handling may cause hazardous conditions, resulting in death or severe injury.
⚠ **CAUTION**	Indicates that incorrect handling may cause hazardous conditions, resulting in minor or moderate injury or property damage.

Under some circumstances, failure to observe the precautions given under " ⚠ CAUTION" may lead to serious consequences.

Observe the precautions of both levels because they are important for personal and system safety.

Make sure that the end users read this manual and then keep the manual in a safe place for future reference.

[Design Precautions]

⚠ WARNING

- Configure safety circuits external to the programmable controller to ensure that the entire system operates safely even when a fault occurs in the external power supply or the programmable controller. Failure to do so may result in an accident due to an incorrect output or malfunction.
  (1) Emergency stop circuits, protection circuits, and protective interlock circuits for conflicting operations (such as forward/reverse rotations or upper/lower limit positioning) must be configured external to the programmable controller.
  (2) When the programmable controller detects an abnormal condition, it stops the operation and all outputs are:
    - Turned off if the overcurrent or overvoltage protection of the power supply module is activated.
    - Held or turned off according to the parameter setting if the self-diagnostic function of the CPU module detects an error such as a watchdog timer error.
  (3) Also, all outputs may be turned on if an error occurs in a part, such as an I/O control part, where the CPU module cannot detect any error. To ensure safety operation in such a case, provide a safety mechanism or a fail-safe circuit external to the programmable controller. For a fail-safe circuit example, refer to the user's manual of the CPU module to use.
  (4) Outputs may remain on or off due to a failure of a component such as a relay and transistor in an output circuit. Configure an external circuit for monitoring output signals that could cause a serious accident.
- In an output circuit, when a load current exceeding the rated current or an overcurrent caused by a load short-circuit flows for a long time, it may cause smoke and fire. To prevent this, configure an external safety circuit, such as a fuse.
- Configure a circuit so that the programmable controller is turned on first and then the external power supply. If the external power supply is turned on first, an accident may occur due to an incorrect output or malfunction.
- For the operating status of each station after a communication failure, refer to manuals relevant to the network. Incorrect output or malfunction due to a communication failure may result in an accident.

[Design Precautions]

⚠ WARNING

- When connecting an external device with a CPU module or intelligent function module to modify data of a running programmable controller, configure an interlock circuit in the program to ensure that the entire system will always operate safely. For other forms of control (such as program modification, parameter change, forced output, or operating status change) of a running programmable controller, read the relevant manuals carefully and ensure that the operation is safe before proceeding. Improper operation may damage machines or cause accidents.
- Especially, when a remote programmable controller is controlled by an external device, immediate action cannot be taken if a problem occurs in the programmable controller due to a communication failure. To prevent this, configure an interlock circuit in the program, and determine corrective actions to be taken between the external device and CPU module in case of a communication failure.
- Do not write any data to the "system area" and "write-protect area" of the buffer memory in the module. Also, do not use any "use prohibited" signals as an output signal from the CPU module to each module. Doing so may cause malfunction of the programmable controller system. For the "system area", "write-protect area", and the "use prohibited" signals, refer to the user's manual for the module used.
- If a communication cable is disconnected, the network may be unstable, resulting in a communication failure of multiple stations. Configure an interlock circuit in the program to ensure that the entire system will always operate safely even if communications fail. Failure to do so may result in an accident due to an incorrect output or malfunction.
- To maintain the safety of the programmable controller system against unauthorized access from external devices via the network, take appropriate measures. To maintain the safety against unauthorized access via the Internet, take measures such as installing a firewall.
- Configure safety circuits external to the programmable controller to ensure that the entire system operates safely even when a fault occurs in the external power supply or the programmable controller. Failure to do so may result in an accident due to an incorrect output or malfunction.
- If safety standards (ex., robot safety rules, etc.,) apply to the system using the module, servo amplifier and servomotor, make sure that the safety standards are satisfied.
- Construct a safety circuit externally of the module or servo amplifier if the abnormal operation of the module or servo amplifier differs from the safety directive operation in the system.
- Do not remove the SSCNETⅢ cable while turning on the control circuit power supply of modules and servo amplifier. Do not see directly the light generated from SSCNETⅢ connector of the module or servo amplifier and the end of SSCNETⅢ cable. When the light gets into eyes, you may feel something wrong with eyes. (The light source of SSCNETⅢ complies with class1 defined in JISC6802 or IEC60825-1.)

[Design Precautions]

⚠ CAUTION

- Do not install the control lines or communication cables together with the main circuit lines or power cables. Keep a distance of 100 mm or more between them. Failure to do so may result in malfunction due to noise.
- During control of an inductive load such as a lamp, heater, or solenoid valve, a large current (approximately ten times greater than normal) may flow when the output is turned from off to on. Therefore, use a module that has a sufficient current rating.
- After the CPU module is powered on or is reset, the time taken to enter the RUN status varies depending on the system configuration, parameter settings, and/or program size. Design circuits so that the entire system will always operate safely, regardless of the time.
- Do not power off the programmable controller or do not reset the CPU module during the setting registration. Doing so will make the data in the flash ROM undefined. The data need to be set in the buffer memory and to be written to the flash ROM again. Doing so may cause malfunction or failure of the module.
- When changing the operating status of the CPU module from external devices (such as remote RUN/STOP), select "Do Not Open by Program" for "Opening Method" in the module parameters. If "Open by Program" is selected, an execution of remote STOP causes the communication line to close. Consequently, the CPU module cannot reopen the communication line, and external devices cannot execute the remote RUN.

[Installation Precautions]

⚠ WARNING

- Shut off the external power supply (all phases) used in the system before mounting or removing the module. Failure to do so may result in electric shock or cause the module to fail or malfunction.

[Installation Precautions]

⚠ CAUTION

- Use the programmable controller in an environment that meets the general specifications in the manual "Safety Guidelines" included in the base unit. Failure to do so may result in electric shock, fire, malfunction, or damage to or deterioration of the product.
- To mount a module, place the concave part(s) located at the bottom onto the guide(s) of the base unit, and push in the module until the hook(s) located at the top snaps into place. Incorrect mounting may cause malfunction, failure, or drop of the module.
- When using the programmable controller in an environment of frequent vibrations, fix the module with a screw.
- Tighten the screws within the specified torque range. Undertightening can cause drop of the screw, short circuit, or malfunction. Overtightening can damage the screw and/or module, resulting in drop, short circuit, or malfunction.
- When using an extension cable, connect it to the extension cable connector of the base unit securely. Check the connection for looseness. Poor contact may cause incorrect input or output.
- When using an SD memory card, fully insert it into the memory card slot. Check that it is inserted completely. Poor contact may cause malfunction.
- Securely insert an extended SRAM cassette into the cassette connector of a CPU module. After insertion, close the cassette cover and check that the cassette is inserted completely. Poor contact may cause malfunction.
- Do not directly touch any conductive parts and electronic components of the module, SD memory card, extended SRAM cassette, or connector. Doing so may cause malfunction or failure of the module.

[Wiring Precautions]

⚠ WARNING

- Shut off the external power supply (all phases) used in the system before installation and wiring. Failure to do so may result in electric shock or damage to the product.
- After installation and wiring, attach the included terminal cover to the module before turning it on for operation. Failure to do so may result in electric shock.

[Wiring Precautions]

⚠ CAUTION

- Individually ground the FG and LG terminals of the programmable controller with a ground resistance of 100 ohm or less. Failure to do so may result in electric shock or malfunction.
- Use applicable solderless terminals and tighten them within the specified torque range. If any spade solderless terminal is used, it may be disconnected when the terminal screw comes loose, resulting in failure.
- Check the rated voltage and signal layout before wiring to the module, and connect the cables correctly. Connecting a power supply with a different voltage rating or incorrect wiring may cause fire or failure.
- Connectors for external devices or coaxial cables must be crimped or pressed with the tool specified by the manufacturer, or must be correctly soldered. Incomplete connections may cause short circuit, fire, or malfunction.
- Securely connect the connector to the module. Poor contact may cause malfunction.
- Do not install the control lines or communication cables together with the main circuit lines or power cables. Keep a distance of 100 mm or more between them. Failure to do so may result in malfunction due to noise.
- Place the cables in a duct or clamp them. If not, dangling cable may swing or inadvertently be pulled, resulting in damage to the module or cables or malfunction due to poor contact. Do not clamp the extension cables with the jacket stripped.
- Check the interface type and correctly connect the cable. Incorrect wiring (connecting the cable to an incorrect interface) may cause failure of the module and external device.
- Tighten the terminal screws or connector screws within the specified torque range. Undertightening can cause drop of the screw, short circuit, fire, or malfunction. Overtightening can damage the screw and/or module, resulting in drop, short circuit, fire, or malfunction.
- When disconnecting the cable from the module, do not pull the cable by the cable part. For the cable with connector, hold the connector part of the cable. For the cable connected to the terminal block, loosen the terminal screw. Pulling the cable connected to the module may result in malfunction or damage to the module or cable.
- Prevent foreign matter such as dust or wire chips from entering the module. Such foreign matter can cause a fire, failure, or malfunction.
- A protective film is attached to the top of the module to prevent foreign matter, such as wire chips, from entering the module during wiring. Do not remove the film during wiring. Remove it for heat dissipation before system operation.
- Programmable controllers must be installed in control panels. Connect the main power supply to the power supply module in the control panel through a relay terminal block. Wiring and replacement of a power supply module must be performed by qualified maintenance personnel with knowledge of protection against electric shock. For wiring, refer to the MELSEC iQ-R Module Configuration Manual.
- For Ethernet cables to be used in the system, select the ones that meet the specifications in the user's manual for the module used. If not, normal data transmission is not guaranteed.

[Startup and Maintenance Precautions]

⚠ WARNING

- Do not touch any terminal while power is on. Doing so will cause electric shock or malfunction.
- Correctly connect the battery connector. Do not charge, disassemble, heat, short-circuit, solder, or throw the battery into the fire. Also, do not expose it to liquid or strong shock. Doing so may cause the battery to generate heat, explode, ignite, or leak, resulting in injury or fire.
- Shut off the external power supply (all phases) used in the system before cleaning the module or retightening the terminal screws, connector screws, or module fixing screws. Failure to do so may result in electric shock or cause the module to fail or malfunction.

[Startup and Maintenance Precautions]

⚠ CAUTION

- When connecting an external device with a CPU module or intelligent function module to modify data of a running programmable controller, configure an interlock circuit in the program to ensure that the entire system will always operate safely. For other forms of control (such as program modification, parameter change, forced output, or operating status change) of a running programmable controller, read the relevant manuals carefully and ensure that the operation is safe before proceeding. Improper operation may damage machines or cause accidents.
- Especially, when a remote programmable controller is controlled by an external device, immediate action cannot be taken if a problem occurs in the programmable controller due to a communication failure. To prevent this, configure an interlock circuit in the program, and determine corrective actions to be taken between the external device and CPU module in case of a communication failure.
- Do not disassemble or modify the modules. Doing so may cause failure, malfunction, injury, or a fire.
- Use any radio communication device such as a cellular phone or PHS (Personal Handyphone System) more than 25 cm away in all directions from the programmable controller. Failure to do so may cause malfunction.
- Shut off the external power supply (all phases) used in the system before mounting or removing the module. Failure to do so may cause the module to fail or malfunction.
- Tighten the screws within the specified torque range. Undertightening can cause drop of the component or wire, short circuit, or malfunction. Overtightening can damage the screw and/or module, resulting in drop, short circuit, or malfunction.
- After the first use of the product, do not mount/remove the module to/from the base unit, and the terminal block to/from the module, and do not insert/remove the extended SRAM cassette to/from the CPU module more than 50 times (IEC 61131-2 compliant) respectively. Exceeding the limit of 50 times may cause malfunction.
- After the first use of the product, do not insert/remove the SD memory card to/from the CPU module more than 500 times. Exceeding the limit may cause malfunction.
- Do not touch the metal terminals on the back side of the SD memory card. Doing so may cause malfunction or failure.
- Do not touch the integrated circuits on the circuit board of an extended SRAM cassette. Doing so may cause malfunction or failure.
- Do not drop or apply shock to the battery to be installed in the module. Doing so may damage the battery, causing the battery fluid to leak inside the battery. If the battery is dropped or any shock is applied to it, dispose of it without using.

[Startup and Maintenance Precautions]

⚠ CAUTION

- Startup and maintenance of a control panel must be performed by qualified maintenance personnel with knowledge of protection against electric shock. Lock the control panel so that only qualified maintenance personnel can operate it.
- Before handling the module, touch a conducting object such as a grounded metal to discharge the static electricity from the human body. Failure to do so may cause the module to fail or malfunction.
- Before testing the operation, set a low speed value for the speed limit parameter so that the operation can be stopped immediately upon occurrence of a hazardous condition.
- Confirm and adjust the program and each parameter before operation. Unpredictable movements may occur depending on the machine.
- When using the absolute position system function, on starting up, and when the module or absolute position motor has been replaced, always perform a home position return.
- Before starting the operation, confirm the brake function.
- Do not perform a megger test (insulation resistance measurement) during inspection.
- After maintenance and inspections are completed, confirm that the position detection of the absolute position detection function is correct.
- Lock the control panel and prevent access to those who are not certified to handle or install electric equipment.

[Operating Precautions]

⚠ CAUTION

- When changing data and operating status, and modifying program of the running programmable controller from an external device such as a personal computer connected to an intelligent function module, read relevant manuals carefully and ensure the safety before operation. Incorrect change or modification may cause system malfunction, damage to the machines, or accidents.
- Do not power off the programmable controller or reset the CPU module while the setting values in the buffer memory are being written to the flash ROM in the module. Doing so will make the data in the flash ROM undefined. The values need to be set in the buffer memory and written to the flash ROM again. Doing so also can cause malfunction or failure of the module.
- Note that when the reference axis speed is specified for interpolation operation, the speed of the partner axis (2nd, 3rd, or 4th axis) may exceed the speed limit value.
- Do not go near the machine during test operations or during operations such as teaching. Doing so may lead to injuries.

[Disposal Precautions]

⚠ CAUTION

- When disposing of this product, treat it as industrial waste.
- When disposing of batteries, separate them from other wastes according to the local regulations. For details on battery regulations in EU member states, refer to the MELSEC iQ-R Module Configuration Manual.

[Transportation Precautions]

⚠ CAUTION

- When transporting lithium batteries, follow the transportation regulations. For details on the regulated models, refer to the MELSEC iQ-R Module Configuration Manual.
- The halogens (such as fluorine, chlorine, bromine, and iodine), which are contained in a fumigant used for disinfection and pest control of wood packaging materials, may cause failure of the product. Prevent the entry of fumigant residues into the product or consider other methods (such as heat treatment) instead of fumigation. The disinfection and pest control measures must be applied to unprocessed raw wood.

CONDITIONS OF USE FOR THE PRODUCT

(1) Mitsubishi programmable controller ("the PRODUCT") shall be used in conditions;
i) where any problem, fault or failure occurring in the PRODUCT, if any, shall not lead to any major or serious accident; and
ii) where the backup and fail-safe function are systematically or automatically provided outside of the PRODUCT for the case of any problem, fault or failure occurring in the PRODUCT.

(2) The PRODUCT has been designed and manufactured for the purpose of being used in general industries.
MITSUBISHI SHALL HAVE NO RESPONSIBILITY OR LIABILITY (INCLUDING, BUT NOT LIMITED TO ANY AND ALL RESPONSIBILITY OR LIABILITY BASED ON CONTRACT, WARRANTY, TORT, PRODUCT LIABILITY) FOR ANY INJURY OR DEATH TO PERSONS OR LOSS OR DAMAGE TO PROPERTY CAUSED BY the PRODUCT THAT ARE OPERATED OR USED IN APPLICATION NOT INTENDED OR EXCLUDED BY INSTRUCTIONS, PRECAUTIONS, OR WARNING CONTAINED IN MITSUBISHI'S USER, INSTRUCTION AND/OR SAFETY MANUALS, TECHNICAL BULLETINS AND GUIDELINES FOR the PRODUCT.
("Prohibited Application")
Prohibited Applications include, but not limited to, the use of the PRODUCT in;
- Nuclear Power Plants and any other power plants operated by Power companies, and/or any other cases in which the public could be affected if any problem or fault occurs in the PRODUCT.
- Railway companies or Public service purposes, and/or any other cases in which establishment of a special quality assurance system is required by the Purchaser or End User.
- Aircraft or Aerospace, Medical applications, Train equipment, transport equipment such as Elevator and Escalator, Incineration and Fuel devices, Vehicles, Manned transportation, Equipment for Recreation and Amusement, and Safety devices, handling of Nuclear or Hazardous Materials or Chemicals, Mining and Drilling, and/or other applications where there is a significant risk of injury to the public or property.

Notwithstanding the above, restrictions Mitsubishi may in its sole discretion, authorize use of the PRODUCT in one or more of the Prohibited Applications, provided that the usage of the PRODUCT is limited only for the specific applications agreed to by Mitsubishi and provided further that no special quality assurance or fail-safe, redundant or other safety features which exceed the general specifications of the PRODUCTs are required. For details, please contact the Mitsubishi representative in your region.

INTRODUCTION

Thank you for purchasing the Mitsubishi MELSEC iQ-R series programmable controllers.
This manual describes the specifications, procedures before operation and wiring of the relevant products listed below.
Before using this product, please read this manual and the relevant manuals carefully and develop familiarity with the functions and performance of the MELSEC iQ-R series programmable controller to handle the product correctly.
When applying the program examples provided in this manual to an actual system, ensure the applicability and confirm that it will not cause system control problems.
Please make sure that the end users read this manual.

Relevant products

R16MTCPU, R32MTCPU

COMPLIANCE WITH EMC AND LOW VOLTAGE DIRECTIVES

Method of ensuring compliance

To ensure that Mitsubishi programmable controllers maintain EMC and Low Voltage Directives when incorporated into other machinery or equipment, certain measures may be necessary. Please refer to one of the following manuals.

📖MELSEC iQ-R Module Configuration Manual

📖Safety Guidelines (This manual is included with the base unit.)

The CE mark on the side of the programmable controller indicates compliance with EMC and Low Voltage Directives.

Additional measures

To ensure that this product maintains EMC and Low Voltage Directives, please refer to the following manual.

📖MELSEC iQ-R Motion Controller User's Manual

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RELEVANT MANUALS

Manual Name [Manual Number]	Description	Available form
MELSEC iQ-R Motion Controller Programming Manual (Common) [IB-0300237] (This manual)	This manual explains the Multiple CPU system configuration, performance specifications, common parameters, auxiliary/ applied functions, error lists and others.	Print book e-Manual EPUB PDF
MELSEC iQ-R Motion Controller User's Manual [IB-0300235]	This manual explains specifications of the Motion CPU modules, SSCNETⅢ cables, synchronous encoder, troubleshooting, and others.	Print book e-Manual EPUB PDF
MELSEC iQ-R Motion Controller Programming Manual (Program Design) [IB-0300239]	This manual explains the functions, programming, debugging for Motion SFC and others.	Print book e-Manual EPUB PDF
MELSEC iQ-R Motion Controller Programming Manual (Positioning Control) [IB-0300241]	This manual explains the servo parameters, positioning instructions, device lists and others.	Print book e-Manual EPUB PDF
MELSEC iQ-R Motion Controller Programming Manual (Advanced Synchronous Control) [IB-0300243]	This manual explains the dedicated instructions to use synchronous control by synchronous control parameters, device lists and others.	Print book e-Manual EPUB PDF

Point

e-Manual refers to the Mitsubishi FA electronic book manuals that can be browsed using a dedicated tool.
e-Manual has the following features:

- Required information can be cross-searched in multiple manuals.
- Other manuals can be accessed from the links in the manual.
- The hardware specifications of each part can be found from the product figures.
- Pages that users often browse can be bookmarked.

TERMS

Unless otherwise specified, this manual uses the following terms.

Term	Description
R32MTCPU/R16MTCPU or Motion CPU (module)	Abbreviation for MELSEC iQ-R series Motion controller
MR-J4(W)-□B	Servo amplifier model MR-J4-□B/MR-J4W-□B
MR-J3(W)-□B	Servo amplifier model MR-J3-□B/MR-J3W-□B
AMP or Servo amplifier	General name for "Servo amplifier model MR-J4-□B/MR-J4W-□B/MR-J3-□B/MR-J3W-□B"
RnCPU, PLC CPU or PLC CPU module	Abbreviation for MELSEC iQ-R series CPU module
Multiple CPU system or Motion system	Abbreviation for "Multiple PLC system of the R series"
CPUn	Abbreviation for "CPU No.n (n = 1 to 4) of the CPU module for the Multiple CPU system"
Operating system software	General name for "SW10DNC-RMTFW"
Engineering software package	General name for MT Developer2/GX Works3
MELSOFT MT Works2	General product name for the Motion controller engineering software "SW1DND-MTW2"
MT Developer2	Abbreviation for the programming software included in the "MELSOFT MT Works2" Motion controller engineering software
GX Works3	General product name for the MELSEC PLC software package "SW1DND-GXW3"
Manual pulse generator	Abbreviation for "Manual pulse generator"
Serial absolute synchronous encoder or Q171ENC-W8	Abbreviation for "Serial absolute synchronous encoder (Q171ENC-W8)"
SSCNETⅢ/H[*1]	High speed synchronous network between Motion controller and servo amplifier
SSCNETⅢ[*1]	
SSCNETⅢ(/H)	General name for SSCNETⅢ/H, SSCNETⅢ
Absolute position system	General name for "system using the servomotor and servo amplifier for absolute position"
Intelligent function module	General name for module that has a function other than input or output such as A/D converter module and D/A converter module.
SSCNETⅢ/H head module[*1]	Abbreviation for "MELSEC-L series SSCNETⅢ/H head module (LJ72MS15)"
Optical hub unit or MR-MV200	Abbreviation for SSCNETⅢ/H Compatible Optical Hub Unit (MR-MV200)

*1 SSCNET: Servo System Controller NETwork

MANUAL PAGE ORGANIZATION

Representation of numerical values used in this manual

In the positioning dedicated signals, "n" in "M3200+20n", etc. indicates a value corresponding to axis No. as shown in the following table.

Axis No.	n	Axis No.	n	Axis No.	n	Axis No.	n
1	0	9	8	17	16	25	24
2	1	10	9	18	17	26	25
3	2	11	10	19	18	27	26
4	3	12	11	20	19	28	27
5	4	13	12	21	20	29	28
6	5	14	13	22	21	30	29
7	6	15	14	23	22	31	30
8	7	16	15	24	23	32	31

- The range of axis No.1 to 16 (n=0 to 15) is valid in the R16MTCPU
- Calculate as follows for the device No. corresponding to each axis.

Ex.

For axis No. 32

M3200+20n (Stop command) = M3200 + 20 × 31 = M3820

M3215+20n (Servo OFF command) = M3215+20 × 31 = M3835

In the positioning dedicated signals, "n" in "M10440+10n", etc. of the "Synchronous encoder axis status", "Synchronous encoder axis command signal", "Synchronous encoder axis monitor device" and "Synchronous encoder axis control device" indicates a value corresponding to synchronous encoder axis No. as shown in the following table.

Synchronous encoder axis No.	n	Synchronous encoder axis No.	n	Synchronous encoder axis No.	n
1	0	5	4	9	8
2	1	6	5	10	9
3	2	7	6	11	10
4	3	8	7	12	11

- Calculate as follows for the device No. corresponding to each synchronous encoder.

Ex.

For synchronous encoder axis No.12

M10440+10n ([St.320] Synchronous encoder axis setting valid flag) = M10440 + 10 × 11 = M10550

D13240+20n ([Md.320] Synchronous encoder axis current value) = D13240 + 20 × 11 = D13460

1 MULTIPLE CPU SYSTEM

1.1 Multiple CPU System

Overview

What is Multiple CPU system?

A Multiple CPU system is a system in which more than one PLC CPU module and Motion CPU module (up to 4 modules) are mounted on several main base unit in order to control the I/O modules and intelligent function modules. Each Motion CPU controls the servo amplifiers connected by SSCNETⅢ cable.

System configuration based on load distribution

- By distributing such tasks as servo control, machine control and information control among multiple processors, the flexible system configuration can be realized.
- You can increase the number of control axes by using a multiple Motion CPU modules. It is possible to control up to 96 axes by using the three CPU modules (R32MTCPU).
- Overall system responsiveness is improved by distributing the high-load processing over several CPU modules.

Communication between CPUs in the Multiple CPU system

- Since device data of other CPUs can be automatically read by the Multiple CPU refresh function, the self CPU can also use device data of other CPUs as those of self CPU.
- Motion dedicated PLC instructions can be used to access device data from the PLC CPU to Motion CPU and start Motion SFC program.

Restrictions on Multiple CPU systems using Motion CPUs

Refer to the following for details on the Multiple CPU system concept (system configuration such as CPU module installation positions, CPU Nos., I/O No. allocation etc.).

MELSEC iQ-R Series Module Configuration Manual

This section describes restrictions when using Motion CPUs.

CPU module installation position

Motion CPUs can only be used with the Multiple CPU system.

Motion CPU modules cannot be installed in CPU slots.

Controllable modules

■MELSEC iQ-R series modules

The following modules can be controlled with a Motion CPU. Modules other than those below cannot be controlled with a Motion CPU.

Module	Model
Input module	RX10
	RX40C7
	RX41C4
	RX42C4
	RX40PC6H
	RX40NC6H
Output module	RY10R2
	RY40NT5P
	RY41NT2P
	RY42NT2P
	RY40PT5P
	RY41PT1P
	RY42PT1P
Input/output composite module	RH42C4NT2P
Analog input module	R60AD4
	R60ADI8
	R60ADV8
	R60AD8-G
	R60AD16-G
Analog output module	R60DA4
	R60DAI8
	R60DAV8
	R60DA8-G
	R60DA16-G
High-speed counter module	RD62D2
	RD62P2
	RD62P2E
Temperature input module	RD60TD8-G
	RD60RD8-G

■MELSEC Q series modules

MELSEC Q series modules cannot be controlled with the Motion CPU. If the Motion CPU is specified as the MELSEC Q series module control CPU, a moderate error (error code: 2020H) is detected when turning ON the Multiple CPU system power supply, and the module cannot be accessed.

Module access range from non-controlling CPU

- Access to MELSEC Q series modules controlled by other CPU is not possible from Motion CPU. (I/O reading from outside the group is also not performed.)
- Module access devices (U□\G) can be read. An error (error code differs for each function) is output when attempting to write.
- X/Y devices for modules controlled by another CPU can be refreshed to a Motion X/Y with the I/O settings for outside the group. However, I/O reading from outside the group is not performed for modules controlled by other CPUs that apply to inter-module synchronization.

Module control with Motion CPUs

The settings required to control modules with Motion CPUs are as follows.

System configuration settings

The system configuration for Multiple CPU systems and common parameters is set in the GX Works3 [Module Configuration] and [System Parameter].
With Motion CPUs, parameters set at GX Works3 are read by MT Developer2, and therefore the system configuration and common parameters are not set at MT Developer2. If setting the system configuration and common parameters, always do so with GX Works3.
Furthermore, module parameters for modules set in the system configuration are set at GX Works3, however, module parameters for modules for which a Motion CPU has been set as the control CPU cannot be set at GX Works3.
Settings for modules controlled by Motion CPUs are specified at the MT Developer2 [Module Configuration List].

Point

For modules used with "High-precision" high-speed input request signals, set the "Synchronization Setting within the Modules" to "Use" in GX Works3, and set the fixed scan interval setting to "0.444ms" or greater. Please note that "Synchronization Setting within the Modules" can be used for modules with 32 or less input/output points.

System configuration setting method

■GX Works3 settings

Set the following parameters at GX Works3.

- Module configuration
- System parameter(I/O assignment setting, Multiple CPU setting, Synchronization setting)
- Set the Motion CPU as the module control CPU in "Control PLC Settings" in [I/O Assignment Setting].

■MT Developer2 settings

- Read the parameters set at GX Works3 using MT Developer2 [System Parameter Diversion].
- Press the "Detailed" button at [R Series Common Parameters] → [Module Configuration List] → "Setting item" in MT Developer2, and then set the parameters for the module for which a Motion CPU set has been set as the control CPU in the module detailed settings that appear.

Module individual settings

The setting items for modules for which a Motion CPU has been set as the control CPU are shown below.

Module	Item		Setting range*1	Default value
Input module	Input/interrupt operation selection		Input/interrupt	Input
	Interrupt condition setting		Leading edge/Trailing edge/Leading edge/trailing edge	—
	Interrupt pointer		I0 to I15	—
	Input response time setting		20μs/50μs/0.1ms/0.2ms/0.4ms/0.6ms/1ms/5ms/10ms/20ms/70ms	*2
Output module	Error-time output mode setting		Clear/Maintain	Clear
I/O module	Input	Input/interrupt operation selection	Input/interrupt	Input
		Interrupt condition setting	Leading edge/Trailing edge/Leading edge/trailing edge	—
		Interrupt pointer	I0 to I15	—
		Input response time setting	0.1ms/0.2ms/0.4ms/0.6ms/1ms/5ms/10ms/20ms/70ms	10ms
	Output	Error-time output mode setting	Clear/Maintain	Clear
High-speed counter module	Pulses input mode		1 phase 1 time/1 phase 2 times/CW/CCW/ 2 phase 1 time/2 phase 2 times/2 phase 4 times	1 phase 1 time
	Counter speed setting		10kpps/100kpps/200kpps/500kpps/1Mpps/2Mpps/4Mpps/8Mpps	10kpps
	Counter type		Linear counter/Ring counter	Linear counter
	Counter operation mode		Pulses counter mode/Pulses measure mode/PWM output mode	Pulses counter mode
	Function input response time setting		Response time 0ms/Response time 0.1ms/ Response time 1ms/Response time 10ms	Response time 0.1ms
	Preset input response time setting		Response time 0ms/Response time 0.1ms/ Response time 1ms/Response time 10ms	Response time 0.1ms
	Error-time output mode setting		Clear/Maintain	Clear
Analog input module	Input range setting		4 to 20mA/0 to 20mA/1 to 5V/0 to 5V/-10V to 10V/ 0 to 10V/4 to 20mA (Extend)/1 to 5V (Extend)/ User range setting	*2
	Operation mode setting		Normal mode(A/D conversion)/Offset/gain setting mode	Normal mode(A/D conversion)
Analog output module	Output range setting		4 to 20mA/0 to 20mA/1 to 5V/0 to 5V/-10V to 10V/-12V to 12V/4 to 20mA (Extend)/1 to 5V (Extend)/User range setting (Voltage)/User range setting (Current)/User range setting 3/User range setting 2/User range setting 1	*2
	Operation mode setting		Normal mode(A/D conversion)/Offset/gain setting mode	Normal mode(A/D conversion)
	Analog output HOLD/CLEAR setting		CLEAR/HOLD	CLEAR
Temperature input module	Resistance temperature detector type setting*3		Pt100(-200 to 850℃)/Pt100(-20 to 120℃)/JPt100(-180 to 600℃)/JPt100(-20 to 120℃)/Pt100(0 to 200℃)/JPt100(0 to 200℃)/Ni100(-60 to 250℃)/Pt50(-200 to 650℃)	Pt100(-200 to 850℃)
	Thermocouple type setting*3		K thermocouple/E thermocouple/J thermocouple/T thermocouple/B thermocouple/R thermocouple/S thermocouple/N thermocouple	K thermocouple
	Offset/gain setting		Factory setting/User range setting	Factory setting
	Operation mode setting		Normal mode (temperature conversion processing)/Offset/gain setting mode	Normal mode (temperature conversion processing)

*1 Items that can be set will differ depending on the module used.
*2 Default values will differ depending on the module used.
*3 Items that can be set will differ depending on the temperature input module used.

Point

Set those module settings not shown above in the buffer memory for each module.

1.2 Setting Operation for Multiple CPU System

This section describes all operation settings for Multiple CPU systems. Specify all operation settings for Multiple CPU systems in the GX Works3 [System Parameter]. Refer to the following for details on all operation settings.
📖MELSEC iQ-R CPU Module User's Manual (Application)

Setting operation for CPU module stop error

If a moderate or major error occurs at any of the CPUs, set whether to stop or continue operation for all CPUs.
Set the stopping mode for the CPU to be stopped in [System Parameter] → [Multiple CPU Setting] → "Multiple CPU Setting" → "Operation Mode Setting" → "Stop Setting" in GX Works3.

Multiple CPU synchronous startup setting

Multiple CPU synchronous startup function synchronizes the startups of CPU No.1 to CPU No.4. (It takes about ten seconds to startup for Motion CPU. After startup, each CPU requires time for initializing.)
Since this function monitors the startup of each CPU module, when other CPU is accessed by a user program, an interlock program which checks the CPU module startup is unnecessary. With the Multiple CPU synchronous startup function, the startup is synchronized with the slowest CPU module to startup; therefore, the system startup may be slow.

Point

Multiple CPU synchronous startup function is for accessing each CPU module in a Multiple CPU system without needing an interlock. This function is not for starting an operation simultaneously among CPU modules after startup.

Multiple CPU synchronous startup setting

Set "Synchronize" in the Multiple CPU synchronous startup setting of the CPU in [System Parameter] → [Multiple CPU Setting] → "Multiple CPU Setting" → "Operation Mode Setting" → "Synchronous Startup Setting"
When not performing Multiple CPU synchronous startup (each CPU startup without synchronization), startup of each CPU module can be confirmed by using special relays SM220 to SM223 (CPU No.1 to 4 READY complete flag).

Clock synchronization between Multiple CPU

Motion CPU clock data is synchronized with the clock of CPU No. 1.
The clock data used for synchronization in a Multiple CPU system can be edited.(☞ Page 102 Clock Function)

1.3 Data Communication Between CPU Modules in the Multiple CPU System

Data transfer is performed between CPU modules in the Multiple CPU system. Data can be written and read between CPUs through communication by refreshing or by direct access. Data communication methods are shown below.

Refer to the following for details on data communication between CPU modules (data communication via CPU buffer memory/ fixed scan communication area).

MELSEC iQ-R CPU Module User's Manual (Application)

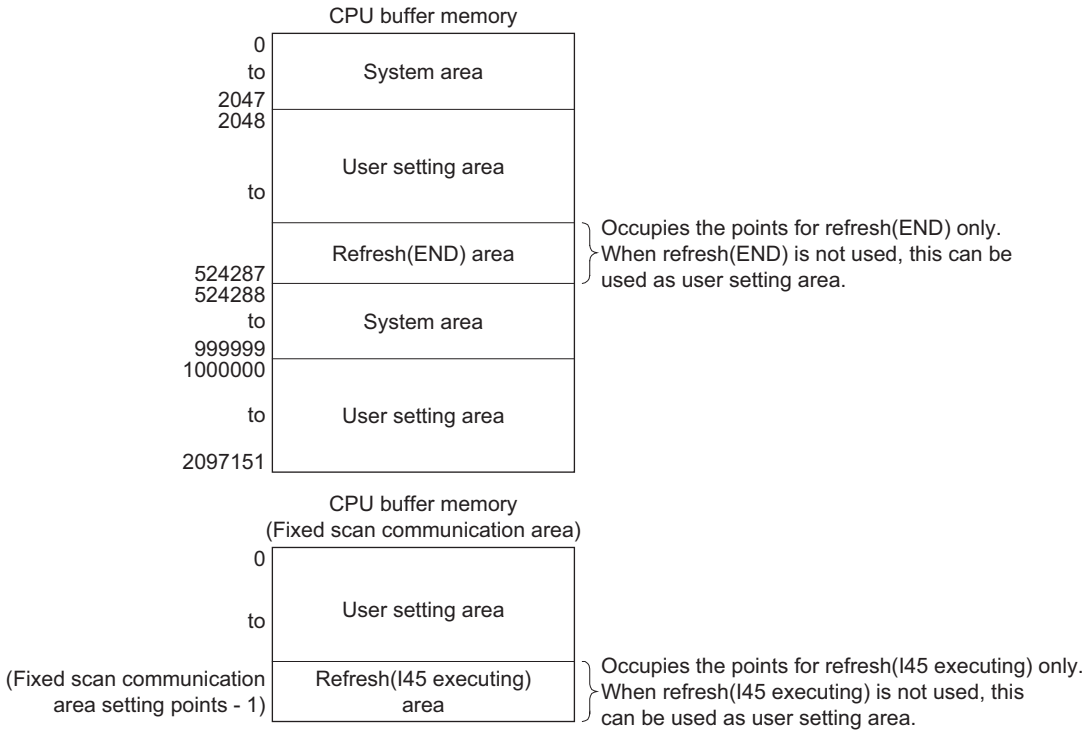
Communication method	Application	Details
Data communication via CPU buffer memory	Use to transfer data based on the timing of the respective CPU modules.	CPU modules transmitting data write to the self CPU buffer memory. CPU modules receiving data read from the self CPU buffer memory of the CPU module (other CPU) from which the data was transmitted.
Data communication via fixed scan communication area	Use to transfer data based on the timing between CPU modules.	CPU modules transmitting data write to the self CPU fixed scan communication area (transmission area). CPU modules receiving data read from the self CPU fixed scan communication area (receipt area) of the CPU module to which the data was transmitted.

Used memory

Data communication between CPU modules uses the CPU buffer memory.

CPU buffer memory configuration

The CPU buffer memory configuration is shown below.



Memory	Communication method	Details	Area size
CPU buffer memory	Communication by direct access	Data reading and writing is performed for the self CPU or other CPU area.	PLC CPU: 512k words Motion CPU: 2M words
Refresh area	Communication by refresh	Data communication is performed by refreshing at END processing.	
Fixed scan communication area*1	Communication by direct access	Data reading and writing is performed for the self CPU fixed scan communication area, and self CPU and other CPU data transfer is performed in fixed scan communication cycles.	Changes can be made within an overall range of 0 to 24k words. The transmission area per module can be set in the 0 to 12k word range.
Refresh area	Communication by refresh	Refresh is performed in fixed scan communication cycles.	

*1 To transfer data using the fixed scan communication area, specify fixed scan communication area settings at GX Works3. Refer to the following for details on fixed scan communication area settings.
MELSEC iQ-R CPU Module User's Manual (Application)

Point

- The system area is determined by the allocation in the system. Use the user area for communicating user data.
- The refresh (END, I45 executing) area is used with the Multiple CPU refresh. Do not directly change this area with a program.

Assurance for data communicated between Multiple CPUs

■Assurance of data sent between CPUs

Due to the timing of data sent from the self CPU and automatic refresh in any of the other CPUs, old data and new data may become mixed (data separation).

The following shows the methods for avoiding data separation at communications by refresh.

- Data consistency for 32 bit data
  Transfer data with refresh method is in units of 32 bits. Since refresh is set in units of 32 bits, 32-bit data does not separate. For word data, 2 words data can be prevented from separating by using an even number to set the first number of each device in refresh setting.
- Data consistency for 64-bit data
  By setting the first number for the device set by refreshing to a multiple of 4, 64-bit data separation can be prevented.
- Data consistency for data exceeding 64 bits
  In refresh method, data is read in descending order of the setting number in refresh setting parameter. Transfer data separation can be avoided by using a transfer number lower than the transfer data as an interlock device.

Data communication by refreshing at Motion CPUs

This section describes data communication by refreshing at Motion CPUs.

Refresh timing

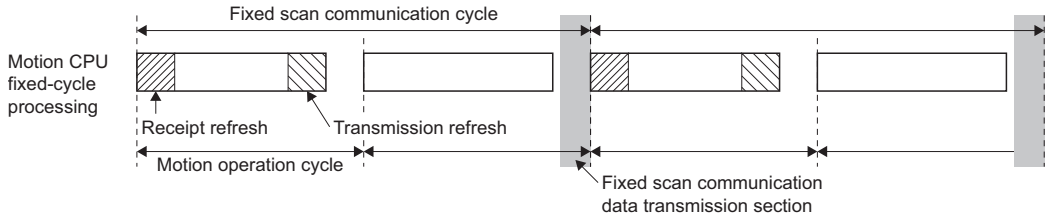
The refresh timing at Motion CPUs differs from that for PLC CPUs. The refresh types and refresh timing are as follows.

Refresh type		Memory used	Refresh timing	
			PLC CPU side	Motion CPU side
MELSEC iQ-R series	Refresh (END)	CPU buffer memory	At END processing	Main cycle
	Refresh (Q compatibility high-speed refresh)*1			Operation cycle and main cycle*2
	Refresh (I45 executing)	Fixed scan communication area	When executing Multiple CPU synchronous interrupt program (I45)	The longer of the operation cycle or fixed scan communication cycle*3
MELSEC Q series (iQ Platform compatible)	Automatic refresh		At END processing	Main cycle
	High-speed refresh			The longer of the operation cycle or 0.888ms and main cycle*2

*1 This is an interchangeable setting equivalent to the MELSEC Q series "High-speed refresh" setting.

*2 The order of processing inside the Motion CPU is as follows.
"Motion SFC event task → Receipt refresh → Motion operation → Transmission refresh"

*3 The order of processing inside the Motion CPU is as follows.
"Receipt refresh → Motion SFC event task → Motion operation → Transmission refresh".
Furthermore, if the operation cycle is shorter than the fixed scan communication cycle, receipt refresh and transmission refresh are performed only at the operation cycle immediately after the fixed scan communication cycle.



Point

If using refresh (fixed scan communication), it is recommended that fixed scan communication cycles and Motion operation cycles be aligned.

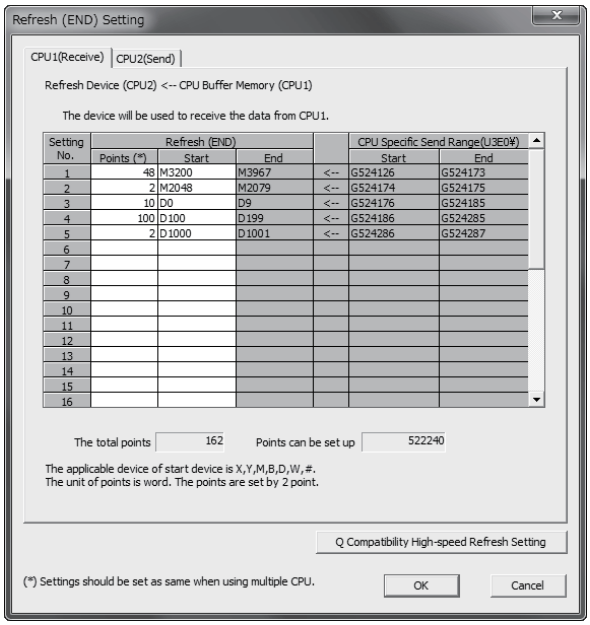
Multiple CPU refresh setting

Setting for communicating by refresh.

In the refresh settings, up to 32 setting ranges (refresh (END) and refresh (I45 executing)) can be set for each CPU module.

[R Series Common Parameter] → [System Parameter] → [Multiple CPU Setting] → "Communication Setting between CPU" → "Refresh (END) Setting" or "Refresh (I45 executing) Setting" → "Detailed Setting"

Window



Displayed items

Item	Setting description	Setting range	Restriction	Data size consistency check
Refresh timing	Select "Detailed setting" based on the timing at which data communication by refresh is executed.	Refresh (END) setting/Refresh (I45 executing)	Fixed-cycle refresh cannot be set if fixed scan communication is invalid.	—
CPU selection	Select the CPU module for editing of the CPU specific send range setting.	CPU No.1 to No.4	CPU No. which exceeds the number of CPU modules cannot be selected.	—
Setting No.	The setting No. for transmission of each CPU module is displayed. Automatic refresh is executed between devices set to the same setting No. for all CPUs that constitute the Multiple CPU system.	1 to 32	—	—
Points	Set the number of points for data communication.	Range: Refer to device list for usable ranges. (☞ Page 66 Device List) Unit: 2 [points]	• Setting which exceeds the number of points of the self CPU send area allocated to each CPU module (CPU specific send range) cannot be set. • Bit device can be specified in units of 32 points (2 words) only.	Provided
Start	Specifies the device which performs the data communication (refresh). Specifies the device sent by the self CPU when the "Send source CPU selection" is the self CPU, and specifies the device received by the self CPU when the CPU specific send range setting is the other CPU.	Usable device (X, Y, M, B, D, W, #)*1	• Bit device can be specified in units of 16 points (1 word) only. • Device number cannot be duplicated.	None

*1 Set "blank" when automatic refresh is not executed.

Point

Parameters set at GX Works3 are read at MT Developer2, and therefore there is no need to specify the refresh (END) and refresh (I45 executing) settings, however, they should be set in the following cases.

- When a Motion register (#) is set to the transmitting device.
- When the Q compatibility high-speed refresh setting is used.

If specifying the Refresh (I45 executing) setting, specify the following settings in the GX Works3 [System Parameter] → [Multiple CPU Setting] → "Communication setting between CPU".

Refer to the following for details on settings.

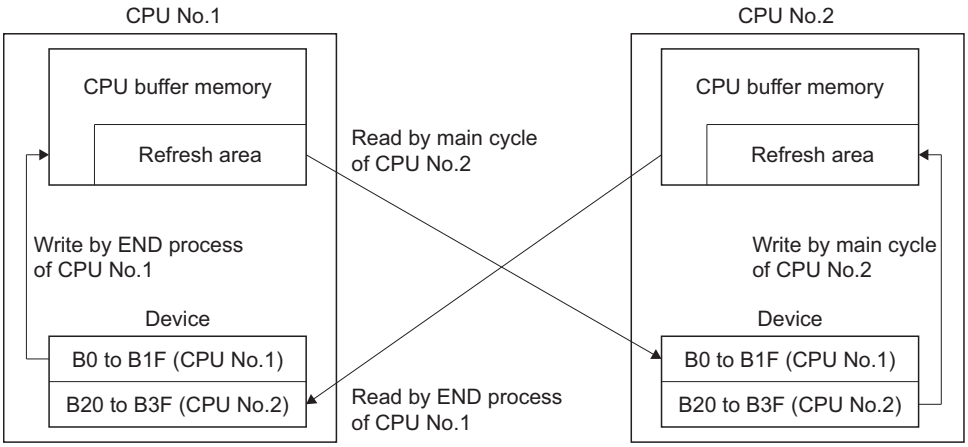
MELSEC iQ-R CPU Module User's Manual (Application)

- Set the "Fixed scan communication function" to "Use".
- Set the send area range for each CPU in the "Fixed scan communication area setting".
- Set the fixed scan interval setting of fixed scan communication (0.222ms/0.444ms/0.888ms/1.777ms/3.555ms/7.111ms) in "Fixed scan communication settings".

Refresh processing performance is improved by setting the first device beginning with a 2-word unit or 4-word unit.

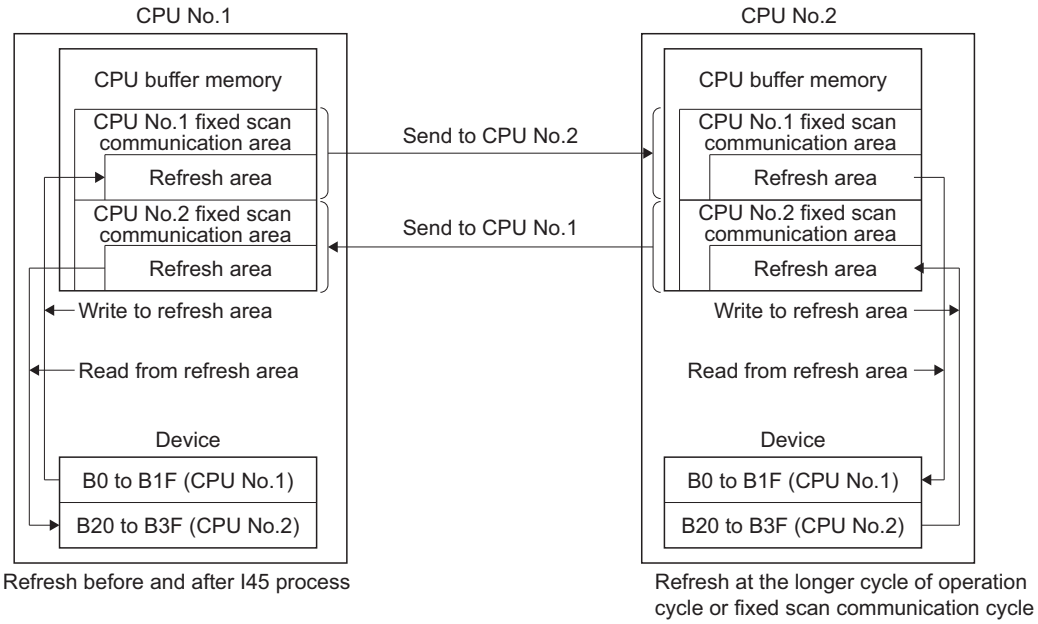
■Operation example of refresh (END) that uses CPU buffer memory

A refresh (END) operation example using the CPU buffer memory is shown below.


CPU No.1
CPU buffer memory
Refresh area
Write by END process of CPU No.1
Device
B0 to B1F (CPU No.1)
B20 to B3F (CPU No.2)
Read by main cycle of CPU No.2
Read by END process of CPU No.1
CPU No.2
CPU buffer memory
Refresh area
Write by main cycle of CPU No.2
Device
B0 to B1F (CPU No.1)
B20 to B3F (CPU No.2)

■Refresh (I45 executing) operation example using fixed scan communication area

A refresh (I45 executing) operation example using the fixed scan communication area is shown below.



Refresh before and after I45 process

Refresh at the longer cycle of operation cycle or fixed scan communication cycle

■Application example of refresh setting (I45 executing)

Refresh setting (I45 executing) is used as in the following applications.

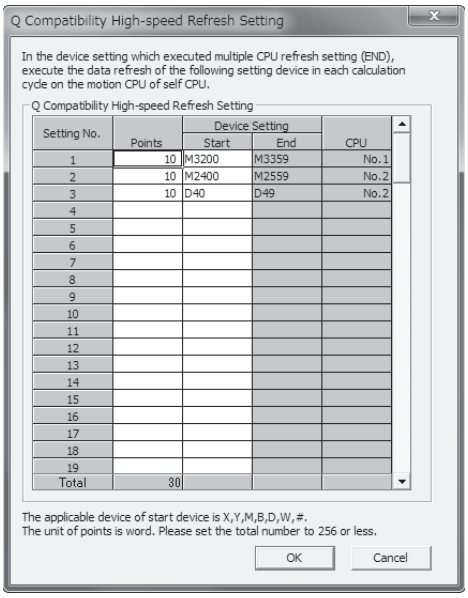
- Read the data such as the real current value and synchronous encoder current value with PLC CPU at high speed.
- Exchange the FIN waiting signal at high speed.

Multiple CPU refresh setting (Q compatibility high-speed refresh setting)

With self Motion CPUs, data between Motion CPU internal devices and the CPU buffer memory is updated every operation cycle in the settings of devices for which refresh (at END) is set.

[R Series Common Parameter] → [System Parameter] → [Multiple CPU Setting] → "Fixed Scan Communication Area Setting" → "Refresh (END) Setting" → "Detailed Setting" → "Q Compatibility High-speed Refresh Setting"

Window


Q Compatibility High-speed Refresh Setting
In the device setting which executed multiple CPU refresh setting (END), execute the data refresh of the following setting device in each calculation cycle on the motion CPU of self CPU.
Q Compatibility High-speed Refresh Setting
Setting No.
Points
Device Setting
Start
End
CPU
1 10 M3200 M3359 No.1
2 10 M2400 M2559 No.2
3 10 D40 D49 No.2
Total 30
The applicable device of start device is X,Y,M,B,D,W,#.
The unit of points is word. Please set the total number to 256 or less.
OK
Cancel

Displayed items

Classification	Item	Description	Setting/display value	Restriction
Display	Setting No.	Setting No. which executes high speed refresh is displayed.	1 to 128 (Up to 128)	
	CPU	CPU No. set in the refresh (END) setting is automatically displayed by setting devices. • Self CPU Refresh from the internal device of Motion CPU to CPU buffer memory. • Other CPU Refresh from the CPU buffer memory to internal device of Motion CPU.	CPU No. 1 to No.4	
User setting	Device setting	Set the device No. of Motion CPU to execute the high speed refreshes.	Usable device: D, W, #, M, X, Y, B	• The start device number must be a multiple of 16 for the bit device. • Cannot set a device not set also in the refresh (END) setting. • No. of "start device+number of points" cannot exceed setting range of each setting No. in refresh (END) setting. • Cannot overlap the device No. between setting No..
	Points	Set the number of points to refresh data of each data in word unit. *: Refresh is not executed when not set.	Range: 2 to 256 [points] Unit: 2 points*1	Sets the total of all CPUs to 256 points or lower.
	Refresh cycle	Operation cycle (fixed)	—	—

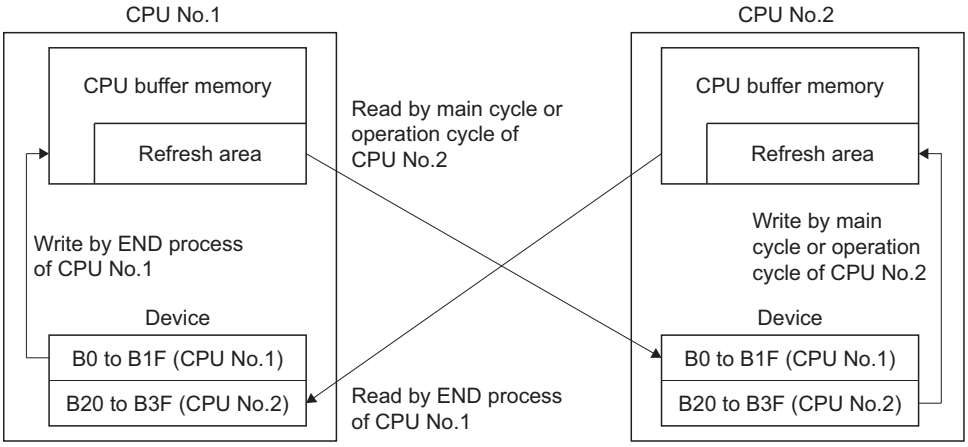
*1 Point in word unit.

Point

This refresh method is a setting for compatibility with the Q series Motion CPU with the purpose of making the data refresh timing equivalent to that of "Multiple CPU high speed refresh" of the Q series Motion CPU.
When configuring a new system, we recommend using refresh (I45 executing) for communication of data that is synchronized with the control of the Motion CPU.

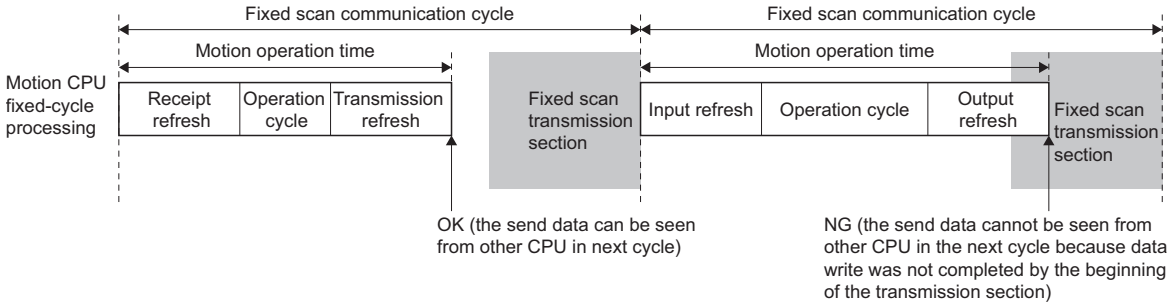
■Operation example of Multiple CPU refresh setting (Q compatibility high-speed refresh setting)

The operation example of Multiple CPU refresh setting (Q compatibility high-speed refresh setting) is shown below.


CPU No.1
CPU buffer memory
Refresh area
Write by END process of CPU No.1
Device
B0 to B1F (CPU No.1)
B20 to B3F (CPU No.2)
Read by main cycle or operation cycle of CPU No.2
Read by END process of CPU No.1
CPU No.2
CPU buffer memory
Refresh area
Write by main cycle or operation cycle of CPU No.2
Device
B0 to B1F (CPU No.1)
B20 to B3F (CPU No.2)

Fixed scan data transmission section over check

A check is performed to verify whether Motion CPU fixed-cycle processing (Motion SFC event tasks, motion operations, etc.) is completed by the data transmission section of the CPU fixed scan communication.
A check can be carried out to detect whether fixed scan transmission data separation has occurred. "Detect/Not detected" and "Stop/Continue" can be selected in the "RAS settings" (refer to ☞ Page 48 CPU parameter).


Fixed scan communication cycle
Fixed scan communication cycle
Motion operation time
Motion operation time
Motion CPU fixed-cycle processing
Receipt refresh
Operation cycle
Transmission refresh
Fixed scan transmission section
Input refresh
Operation cycle
Output refresh
Fixed scan transmission section
OK (the send data can be seen from other CPU in next cycle)
NG (the send data cannot be seen from other CPU in the next cycle because data write was not completed by the beginning of the transmission section)

Checks are performed as follows depending on the relationship between the motion operation cycle and fixed scan communication cycle.

When motion operation cycle < fixed scan communication cycle

A check is performed only when an operation cycle over condition is detected, and not performed otherwise.

When motion operation cycle = fixed scan communication cycle

A check is performed every cycle.

When motion operation cycle > fixed scan communication cycle

A check is performed only at the fixed scan communication section immediately before the motion operation cycle. No check is performed part of the way into a fixed scan communication section during a motion operation cycle, thus if a cycle shorter than the motion operation cycle is referenced from another CPU, separation may occur even if no error occurs when performing this check.

Special relay/special register

The special relay and special register relating to the fixed scan data communication section excess check are shown below. Refer to the following for details on special relays and special registers.

- Special relay(☞ Page 295 Special Relays)
- Special register(☞ Page 300 Special Registers)

Device	Number	Name
Special relay	SM484	Fixed scan data transmission section over
Special register	SD484	Fixed scan data transmission section over count

Inter-module synchronization function

Inter-module synchronization function overview

- By using the inter-module synchronization function, control timing can be synchronized across Motion CPUs, I/O modules, and intelligent function modules. By enabling inter-module synchronization for modules controlled by a Motion CPU, motion control and synchronized I/O control are possible.
- With the inter-module synchronization function, each module executes a "Inter-module synchronization interrupt program" to perform fixed-cycle control. At the Motion CPU, overall Motion CPU fixed-cycle processing (Motion SFC fixed-cycle event tasks, motion operation processing, etc.) corresponds to the inter-module synchronization interrupt program.
- By enabling the inter-module synchronization function between Multiple CPUs, the execution timing for self CPU Motion CPU fixed-cycle processing and other CPU inter-module synchronization interrupt programs (PLC CPU 144 interrupt program, Motion CPU fixed-cycle processing) can be synchronized.
- Set the inter-module synchronization function in the following cases.
  - When using I/O module signals as high-speed input request signals
  - When using a synchronous encoder via a high-speed counter module (By enabling inter-module synchronization, variations between synchronous encoder input value operation cycles are reduced.)

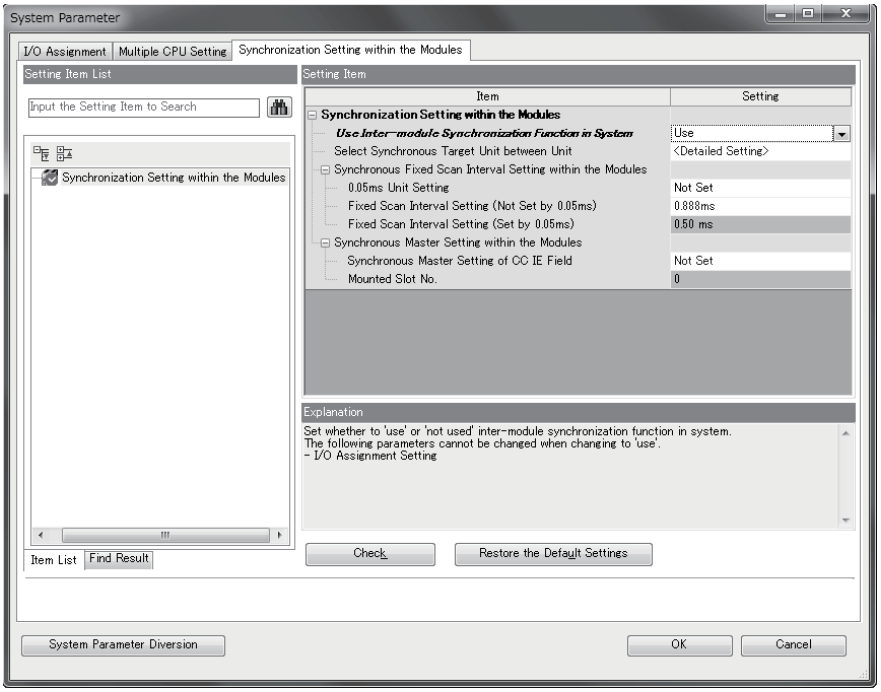
Point

Refer to the following for details on the overall system inter-module synchronization function, including PLC CPUs and network modules.

MELSEC iQ-R Inter-Module Synchronization Function Reference Manual

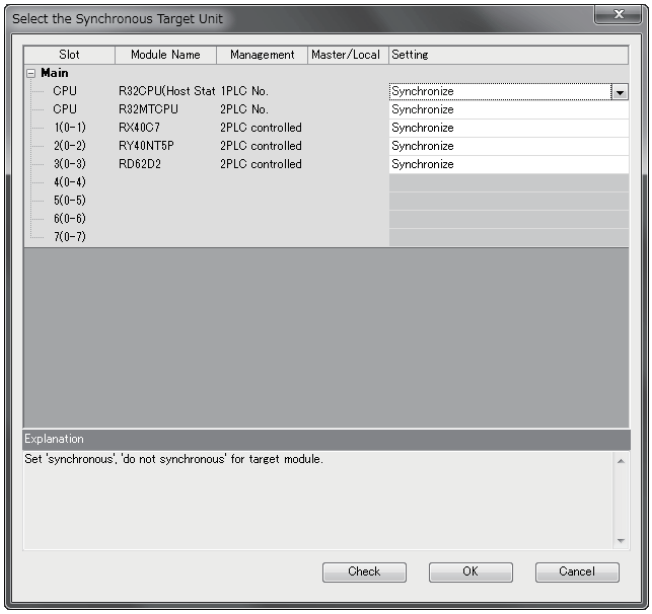
Inter-module synchronization setting

Set the inter-module synchronization settings in [System Parameter] → [Synchronization Setting within the Modules] → "Synchronization Setting within the Modules" of GX Works3. Inter-module synchronization settings must be consistent across the Multiple CPU system.



If setting inter-module synchronization settings at the Motion CPU, set as follows.

Operating procedure



1. Set "Use inter-module synchronization function in system" to "Use".

2. Set "Synchronize" from the setting of the selected synchronization target module displayed in "Select the synchronous target unit", for the module to be synchronized.

3. Set the "Inter-module synchronization target module selection" as follows.

- Set "0.05ms unit setting" to "Not set".
- Set the following fixed scan interval compatible with the Motion CPU in "Fixed scan interval setting (not set by 0.05ms)".
  (0.222ms, 0.444ms, 0.888ms, 1.777ms, 3.555ms, 7.111ms)[*1]

*1 If a fixed scan interval other than the above that is not compatible with the Motion CPU is set, a moderate error (error code: 2222H) occurs when the Multiple CPU system power supply is turned ON.

The operating status of the inter-module synchronization function for each module can be checked with the GX Works3 system monitor function.

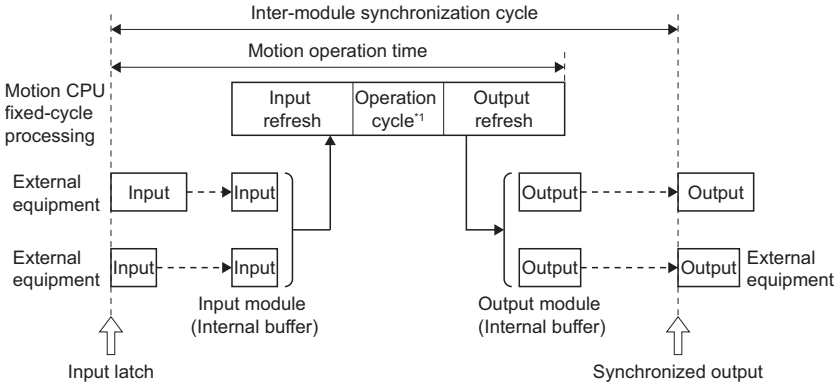
Inter-module synchronization target refresh settings

Refresh settings are not required for modules controlled by Motion CPUs. I/O (X/Y) refresh is performed for all modules controlled by Motion CPU control. Also, perform read to and write from the module buffer memory by direct access with a module access device (U□\G).

Inter-module synchronization control timing

■Timing of I/O refresh processing

When using the inter-module synchronization function, the timing of motion operation cycles with Motion CPUs is linked to inter-module synchronization cycles. Refresh of inter-module synchronization target modules I/O (X/Y) is performed before and after Motion CPU fixed-cycle processing (Motion SFC fixed-cycle event tasks, motion operation processing, etc.) The processing timing is as follows.



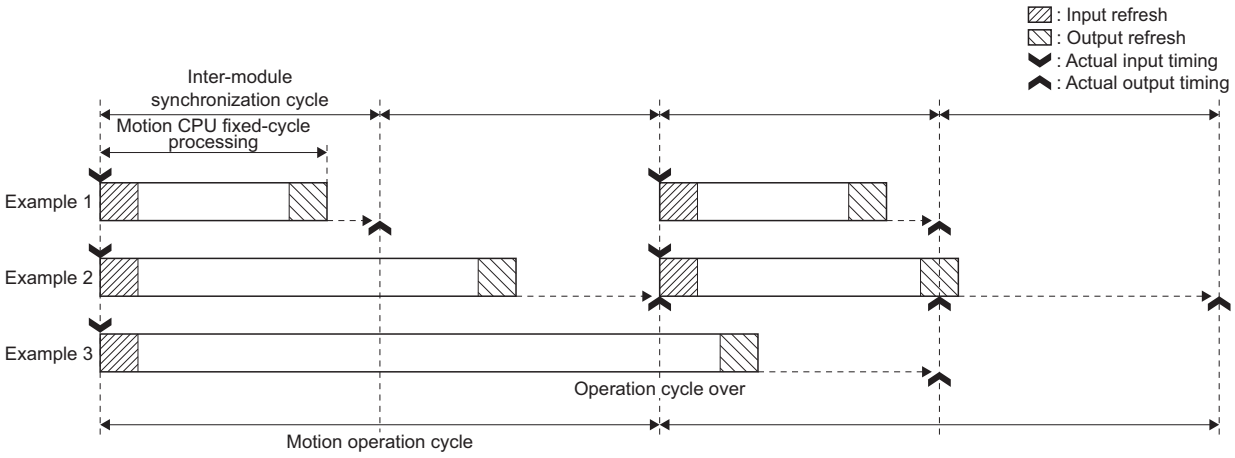
*1 Motion SFC event task and Motion real-time task processing

Inter-module synchronization target module input (X) refresh is performed when starting Motion CPU fixed-cycle processing, and output (Y) refresh is performed when Motion CPU fixed-cycle processing is complete. Perform read to and write from the module buffer memory by direct access with a module access device (U□\G). Depending on the module, a buffer memory is available for inter-module synchronous control. Refer to the User's Manual of each module for details on module operation relating to the inter-module synchronization function.

■When the inter-module synchronization cycle and motion operation cycle differ

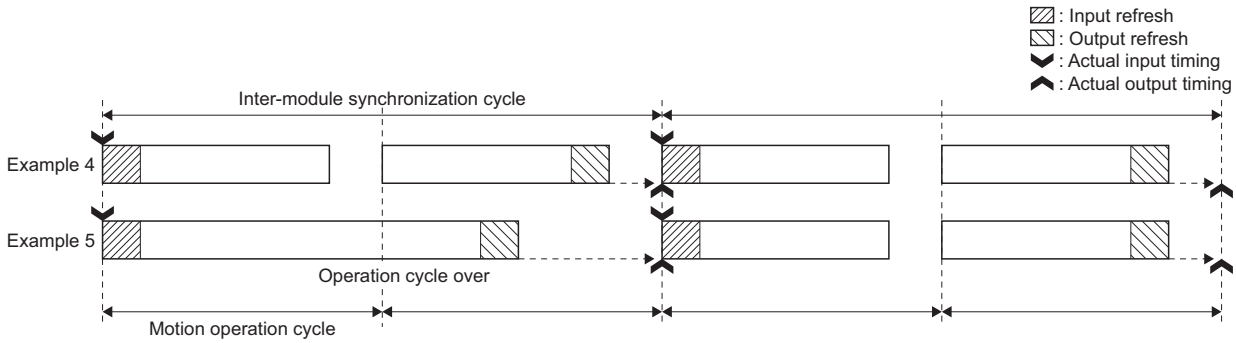
The processing timing if the inter-module synchronization cycle and motion operation cycle differ is as follows.

- When inter-module synchronization cycle < motion operation cycle



- The Y device content at the moment output refresh processing is executed is output at the inter-module synchronization cycle immediately after. (Example 1, 2)
- When the timing of the output refresh and inter-module synchronization cycle overlap, a discrepancy in the actual output timing may occur depending on the module. (Example 2) Therefore, to align the actual output timing of all modules, ensure that the "inter-module synchronization cycle ≥ motion operation cycle".
- If the Motion CPU fixed-cycle processing time, including output refresh processing, does not end within the motion operation cycle, an operation cycle over is detected. (Example 3)

• When inter-module synchronization cycle > motion operation cycle



- Input refresh is performed when processing the first Motion CPU fixed cycle within the inter-module synchronization cycle. Output refresh is performed when processing the last Motion CPU fixed cycle within the inter-module synchronization cycle. (Example 4)
- If the Motion CPU fixed-cycle processing time, including output refresh processing, does not end within the motion operation cycle, an operation cycle over is detected. (Example 5)

CPU module operating status and refresh operation

The CPU module operating status when using the inter-module synchronization function and the I/O (X/Y) refresh operation are shown below.

CPU operating status	Refresh executed/not executed	I/O (X/Y) refresh timing	Remarks
RUN (including when continue error occurs)	Refresh	Motion operation cycle*1	
STOP (including when stop error occurs due to moderate error)			• Refresh OFF for Y.*2 • Refresh is not performed at such times as when the module does not start up or refresh does not function due to a parameter error, etc.
STOP (when major error occurs)	Do not refresh	—	
Test mode (including when continue error occurs)	Refresh	Motion operation cycle*1	

*1 Refresh is still performed if interrupt is prohibited with a Motion SFC DI instruction.
*2 The Y immediately before going into STOP status is saved, and all devices are turned OFF. Not all modules are turned OFF if there are modules with allocations as synchronous encoder/manual pulse generator inputs.

Inter-module synchronization processing time

When using the inter-module synchronization function with a Motion CPU, I/O refresh is performed when processing fixed cycles in the Motion CPU, therefore processing time increases by the increased amount of motion operation time. The following is a guideline for inter-module synchronization function processing time.

Inter-module synchronization function processing time = 5[μs] + 0.7[μs] × Number of input points *1+3[μs] × Number of output points *1

*1 Total number of I/O points (words) for modules that are part of inter-module synchronization and controlled by the Motion CPU

If an operation cycle over condition occurs, review the module subject to synchronization and the inter-module synchronization cycle settings.

Point

If not using the inter-module synchronization function, by accessing actual I/O (X/Y) at the Motion SFC fixed-cycle event task, bus access occurs for each instruction, causing a drop in performance.
If using the inter-module synchronization function, an overhead occurs for the amount of processing time mentioned above, and actual I/O (X/Y) are collectively refreshed, which can reduce motion operation time.

Special relay/special register

The special relays and special register relating to the inter-module synchronization function are shown below. Refer to the following for details on special relays and special registers.

- Special relay(☞ Page 295 Special Relays)
- Special register(☞ Page 300 Special Registers)

Device	Number	Name
Special relay	SM480	Motion CPU operation cycle over
	SM488	Module synchronization error detection
Special register	SD480	Motion CPU operation cycle over counter No.

Inter-module synchronization function in Multiple CPU configuration

■Operating specifications

Refer to relationship between fixed scan communication and inter-module synchronization for the motion operation cycle relationship when fixed scan communication and inter-module synchronization are combined. (☞ Page 41 Relationship between fixed scan communication and inter-module synchronization)

The data flow when fixed scan communication and the inter-module synchronization function are combined and communicating with the PLC CPU is as follows.

- When the Multiple CPU synchronous interrupt function and inter-module synchronization function are combined (PLC CPU → Motion CPU)

  Two inter-module synchronization cycles are required for data acquired by the PLC CPU by the time it reaches the Motion CPU via the CPU buffer memory (fixed scan communication area). When synchronizing output between CPUs, use a function block for the inter-module synchronization function with a PLC CPU, and program taking into account the difference in output timing (two cycles) between the PLC CPU control module and Motion CPU control module.

- When the Multiple CPU synchronous interrupt function and inter-module synchronization function are combined (Motion CPU → PLC CPU)

  One inter-module synchronization cycle is required for data acquired by the Motion CPU by the time it reaches the PLC CPU via the CPU buffer memory (fixed scan communication area). If synchronizing output between CPUs, adjust the number of Motion SFC fixed-cycle event task consecutive transitions for the Motion CPU, and program taking into account the difference in output timing (one cycle) between the PLC CPU control module and Motion CPU control module.

■Module access from other CPU

Even if the following settings are set in GX Works3, inputs (X) and outputs (Y) cannot be read from modules subject to the inter-module synchronization function. Reading from the buffer memory is possible by direct access with a module access device (U□\G), FROM instruction, etc.

- When set to "import" at the [System Parameter] → [Multiple CPU Setting] → "Other PLC Control Module Setting" → "I/O Setting Outside Group".

■Aligning the inter-module synchronization function start timing at all CPUs, all stations

Specify the following settings in GX Works3.

- Set each module in [System Parameter] → [Synchronization Setting within the Modules] → "Select Synchronous Target Unit between Unit" to "Synchronize".
- Set all CPUs in [System Parameter] → [Multiple CPU Setting] → "Operation Mode Setting" → "Synchronous Startup Setting" to "Synchronize".

■Link between inter-module synchronization function and CPU fixed scan communication

When the following are set in GX Works3, CPU fixed scan communication operates based on the fixed scan interval set with the inter-module synchronization function, enabling control with the timing of both inter-module synchronization function and CPU fixed scan communication aligned.

- Set "Cooperate" in [System Parameter] → [Multiple CPU Setting] → "Communication Setting Between CPU" → "Fixed Scan Communication Function" → "Fixed Scan Interval Setting of Fixed Scan Communication" → "Fixed Scan Communication Function and Inter-Module Synchronization Function".

Point

If using both the fixed scan communication function and inter-module synchronization function, set "Fixed Scan Communication Function and Inter-Module Synchronization Function" to "Cooperate". If set to "Not cooperated", a moderate error (error code: 2222H) occurs, and the Motion CPU does not RUN.

Inter-module synchronization function operation when the CPU operating status changes

■Operation at power supply ON, reset

- Normal startup (RUN)

  If there are no setting errors in the parameters etc. after analysing inter-module synchronization function related settings (system parameters, CPU parameters, module parameters) written to the Motion CPU when turning the Multiple CPU system power supply ON or when cancelling a reset, the inter-module synchronization function operates.

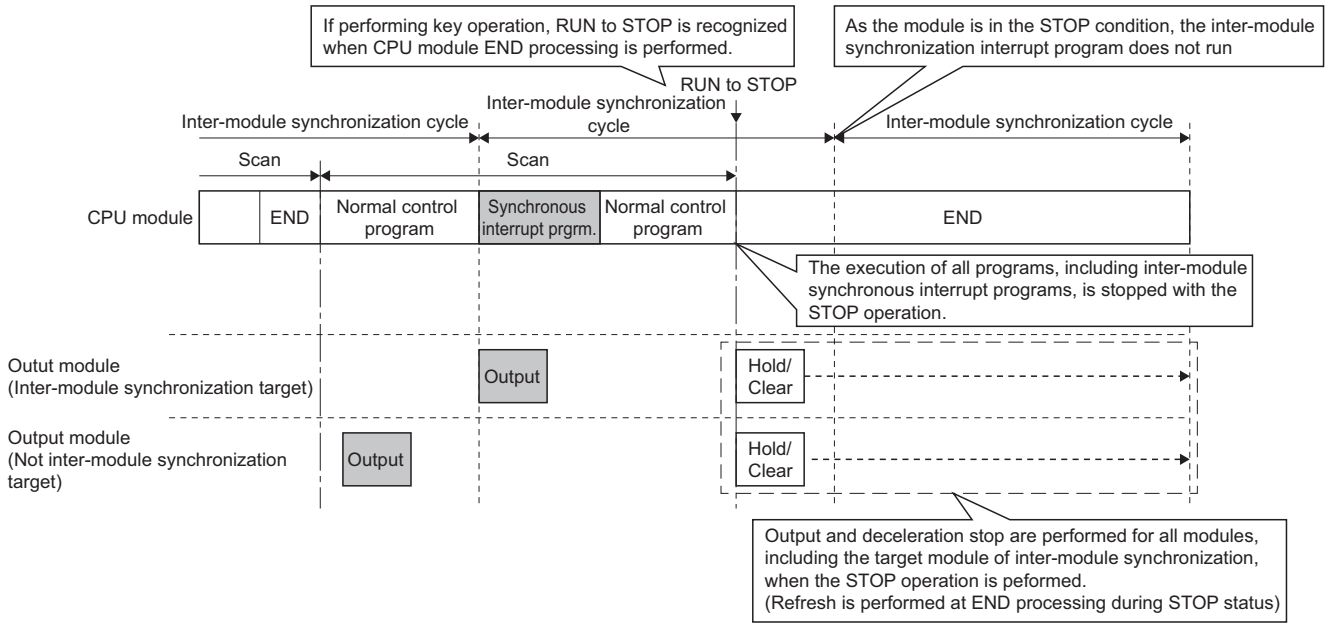
- Abnormal stop (STOP)

  When parameter inconsistencies between Multiple CPUs or network parameter setting errors, etc. occur, or if module hardware errors have occurred when analysing inter-module synchronization function related settings (system parameters, CPU parameters, module parameters) written to the Motion CPU when turning the Multiple CPU system power supply ON or when cancelling a reset, the inter-module synchronization function does not operate, and a stop error occurs. When this happens, I/O refresh is not performed.

■Operation at STOP (RUN → STOP)

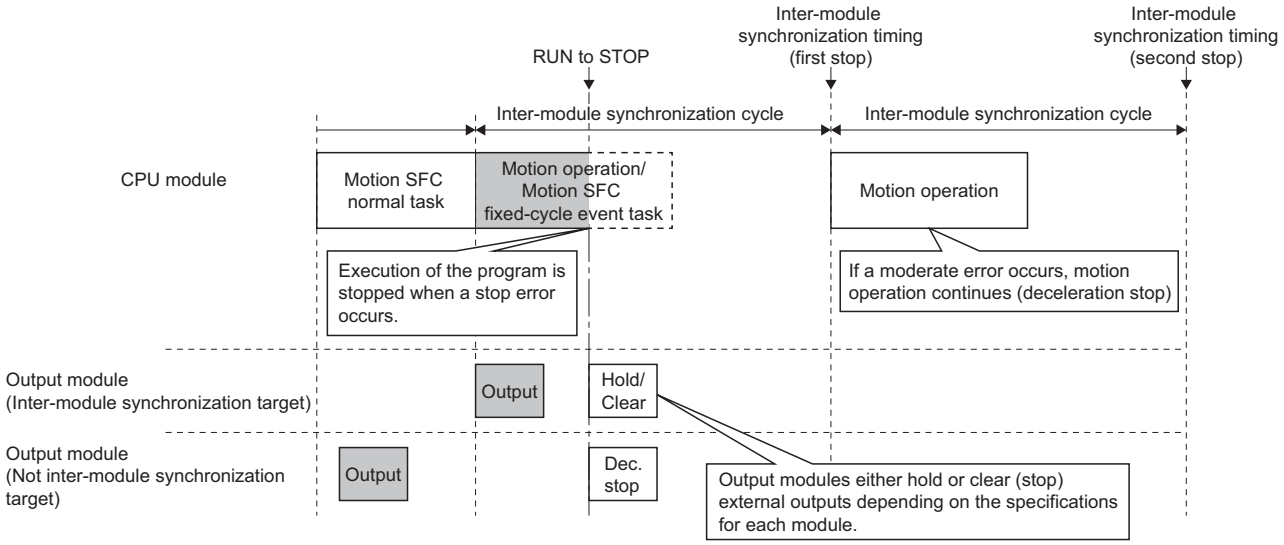
- Normal stop

  I/O refresh continues even during a STOP condition. With a normal stop operation such as STOP, Motion CPU output is turned OFF, and a stop command is issued to each module. Refer to the User's Manual for each module for details on operation when the module stops normally.


If performing key operation, RUN to STOP is recognized when CPU module END processing is performed.
As the module is in the STOP condition, the inter-module synchronization interrupt program does not run
RUN to STOP
Inter-module synchronization cycle
Inter-module synchronization cycle
Inter-module synchronization cycle
Scan
Scan
CPU module
END
Normal control program
Synchronous interrupt prgrm.
Normal control program
END
The execution of all programs, including inter-module synchronous interrupt programs, is stopped with the STOP operation.
Outut module (Inter-module synchronization target)
Output
Hold/ Clear
Output module (Not inter-module synchronization target)
Output
Hold/ Clear
Output and deceleration stop are performed for all modules, including the target module of inter-module synchronization, when the STOP operation is peformed.
(Refresh is performed at END processing during STOP status)

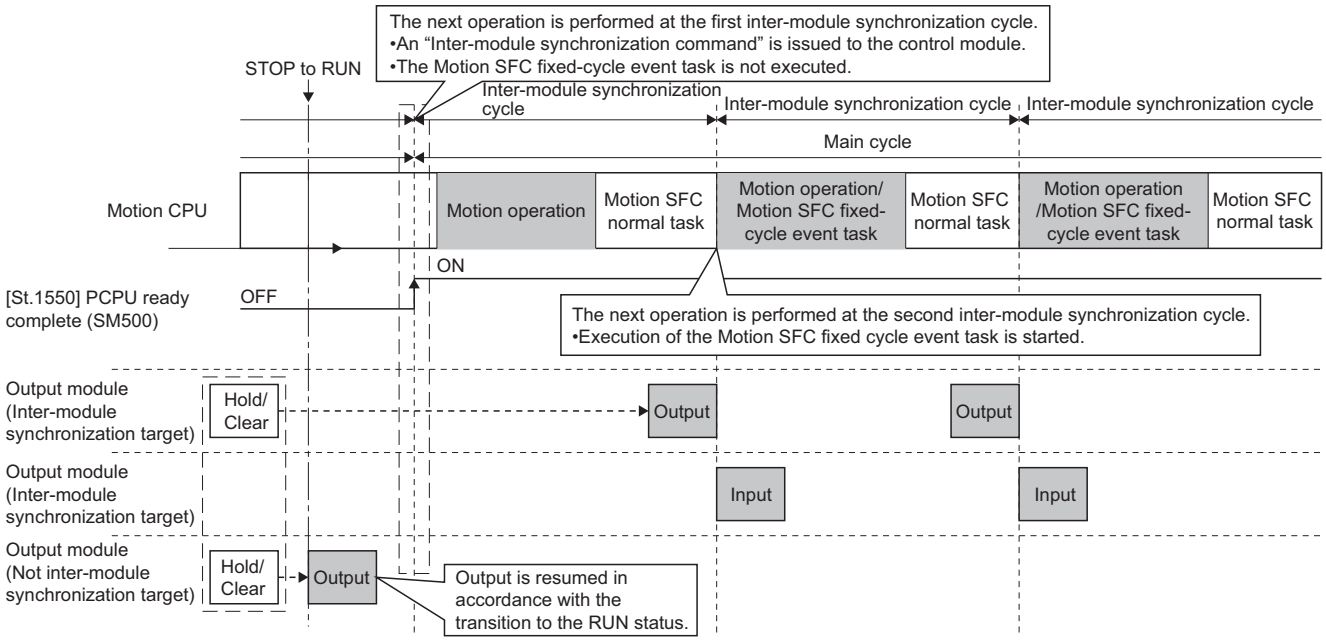
- Abnormal stop

  If a Motion CPU major/moderate error occurs (including cases where settings ensure that Motion CPUs stop at a major/moderate error at each module), Motion CPU output is turned OFF (there are also cases when output is retained depending on the parameter settings), and a stop command is issued to the control module. I/O refresh continues even during a STOP condition. Refer to the User's Manual for each module for details on operation when the module stops abnormally.


RUN to STOP
Inter-module synchronization timing (first stop)
Inter-module synchronization timing (second stop)
Inter-module synchronization cycle
Inter-module synchronization cycle
CPU module
Motion SFC normal task
Motion operation/ Motion SFC fixed-cycle event task
Motion operation
Execution of the program is stopped when a stop error occurs.
If a moderate error occurs, motion operation continues (deceleration stop)
Output module (Inter-module synchronization target)
Output
Hold/ Clear
Output module (Not inter-module synchronization target)
Output
Dec. stop
Output modules either hold or clear (stop) external outputs depending on the specifications for each module.

■Operation at RUN (STOP → RUN)

When the Motion CPU is changed from STOP to RUN, the Motion CPU issues an inter-module synchronization start command to each module at the next inter-module synchronization cycle after STOP to RUN, and begins execution of the Motion SFC fixed-cycle event task at the next inter-module synchronization cycle.


The next operation is performed at the first inter-module synchronization cycle.
•An "Inter-module synchronization command" is issued to the control module.
•The Motion SFC fixed-cycle event task is not executed.
STOP to RUN
Inter-module synchronization cycle
Inter-module synchronization cycle
Inter-module synchronization cycle
Main cycle
Motion CPU
Motion operation
Motion SFC normal task
Motion operation/ Motion SFC fixed-cycle event task
Motion SFC normal task
Motion operation /Motion SFC fixed-cycle event task
Motion SFC normal task
ON
[St.1550] PCPU ready complete (SM500)
OFF
The next operation is performed at the second inter-module synchronization cycle.
•Execution of the Motion SFC fixed cycle event task is started.
Output module (Inter-module synchronization target)
Hold/ Clear
Output
Output
Output module (Inter-module synchronization target)
Input
Input
Output module (Not inter-module synchronization target)
Hold/ Clear
Output
Output is resumed in accordance with the transition to the RUN status.

Please note that if system parameters related to the inter-module synchronization function are rewritten during STOP, analysis is not performed at STOP to RUN, and therefore the module operates based on parameters before rewriting. The changed parameters will be valid the next time the Multiple CPU system power supply is turned ON, or when reset.

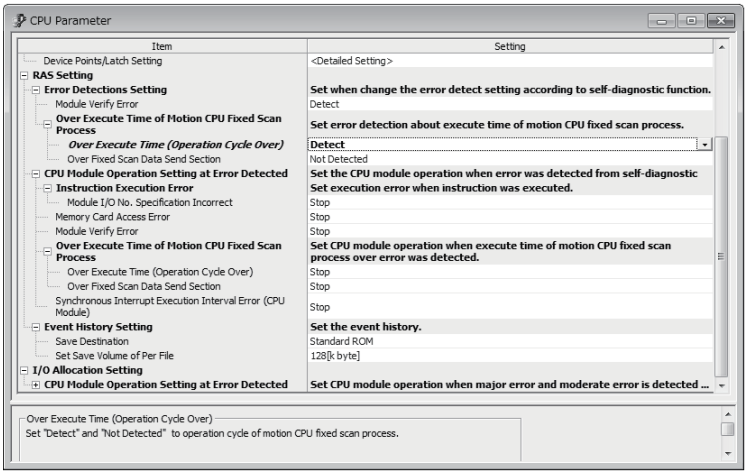
Error detection

The following error statuses are monitored at the Motion CPU.

■Execution time monitoring of the Motion CPU fixed-cycle processing

Regardless of whether the inter-module synchronization function is used, the Motion CPU fixed-cycle processing (inter-module synchronization I/O refresh, Motion SFC fixed-cycle event task, motion operation processing, etc.) execution time is monitored. When Motion CPU fixed-cycle processing is not completed within the motion operation cycle, the number of times that a Motion CPU fixed-cycle processing cycle error occurs is stored in "Motion CPU operation cycle over counter No. (SD480)".

When "Over Execute Time (Operation Cycle Over)" in [CPU Parameter] → "RAS Setting" → "Error Detections Setting" is set to "Detect", "Stop" or "Continue" can be selected for Motion CPU operation processing. When set to "Detect", a moderate error (error code: 2600H) is output.


CPU Parameter
Item
Setting
Device Points/Latch Setting
<Detailed Setting>
RAS Setting
Error Detections Setting
Set when change the error detect setting according to self-diagnostic function.
Module Verify Error
Detect
Over Execute Time of Motion CPU Fixed Scan Process
Set error detection about execute time of motion CPU fixed scan process.
Over Execute Time (Operation Cycle Over)
Detect
Over Fixed Scan Data Send Section
Not Detected
CPU Module Operation Setting at Error Detected
Set the CPU module operation when error was detected from self-diagnostic
Instruction Execution Error
Set execution error when instruction was executed.
Module I/O No. Specification Incorrect
Stop
Memory Card Access Error
Stop
Module Verify Error
Stop
Over Execute Time of Motion CPU Fixed Scan Process
Set CPU module operation when execute time of motion CPU fixed scan process over error was detected.
Over Execute Time (Operation Cycle Over)
Stop
Over Fixed Scan Data Send Section
Stop
Synchronous Interrupt Execution Interval Error (CPU Module)
Stop
Event History Setting
Set the event history.
Save Destination
Standard ROM
Set Save Volume of Per File
128[k byte]
I/O Allocation Setting
CPU Module Operation Setting at Error Detected
Set CPU module operation when major error and moderate error is detected ...
Over Execute Time (Operation Cycle Over)
Set "Detect" and "Not Detected" to operation cycle of motion CPU fixed scan process.

■Inter-module synchronization signal error monitor

Inter-module synchronization signal cycle errors are monitored, and a moderate error (error code: 2610H) occurs if there is an error.

Motion CPU operation processing can bet set to "Stop" or "Continue" when a inter-module synchronization signal error occurs with [CPU Parameter] → "RAS Setting" → "CPU Module Operation Setting at Error Detected".

Point

When "Synchronous Interrupt Execution Interval Error (CPU module)" is set to "Continue", if the continuation error is cancelled, the Motion CPU ERROR LED turns OFF but the error factor is not removed. Furthermore, errors are not detected again even if a synchronous interrupt execution interval error reoccurs.

Relationship between fixed scan communication and inter-module synchronization

If using fixed scan communication and inter-module synchronization between multiple CPUs, the relationship between motion operations and Motion SFC event task (fixed-cycle tasks) is as follows.

			Inter-module synchronization function	
			Not used*1	Used
Fixed scan communication function	Not used		Motion CPU inherent cycle	Synchronization with inter-module synchronization cycle*2 (timing example 2)
	Used	If the "Fixed scan communication function and inter-module synchronization function" setting is "Not cooperated".	Synchronization with fixed scan communication cycle*2 (timing example 1)	Moderate error (error code: 2222H)
		If the "Fixed scan communication function and inter-module synchronization function " setting is "Cooperate".	Setting not possible with Engineering Tool	Inter-module synchronization cycle =synchronization with fixed scan communication cycle*1 (timing example 3)

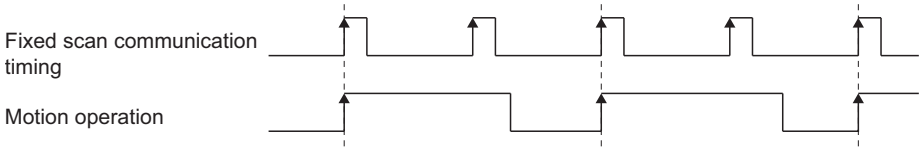
*1 If inter-module synchronization function is set to not used, or if the Motion CPU is not the module subject to inter-module synchronization.

*2 If the motion operation cycle and fixed scan communication cycle, or the inter-module synchronization cycle differ, the start timing with longer cycle is always synchronized with the start timing with shorter cycle.

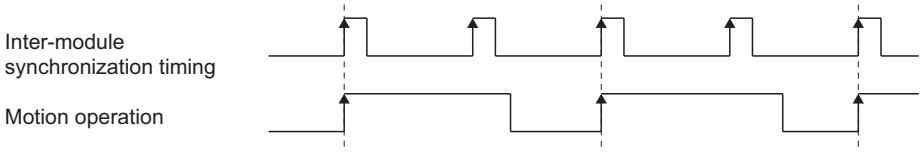
Point

If a cycle (other than 0.222ms, 0.444ms, 0.888ms, 1.777ms, 3.555ms, 7.111ms) not compatible with Motion CPUs is set for a fixed scan communication cycle or inter-module synchronization cycle, a moderate error (error code: 2222H) occurs when the Multiple CPU system power supply is turned ON.

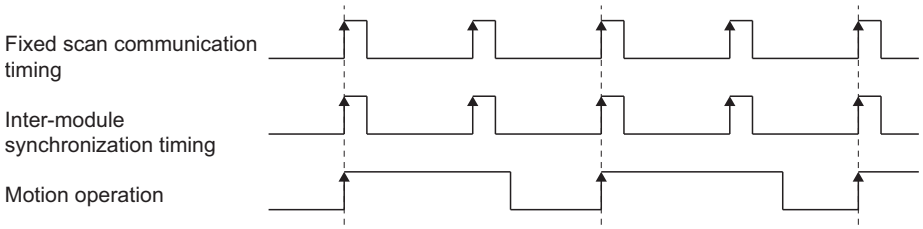
Timing Example 1



Timing Example 2



Timing Example 3



Control instruction from PLC CPU to Motion CPU

Control can be instructed from the PLC CPU to the Motion CPU using the Motion dedicated PLC instructions listed in the table below.

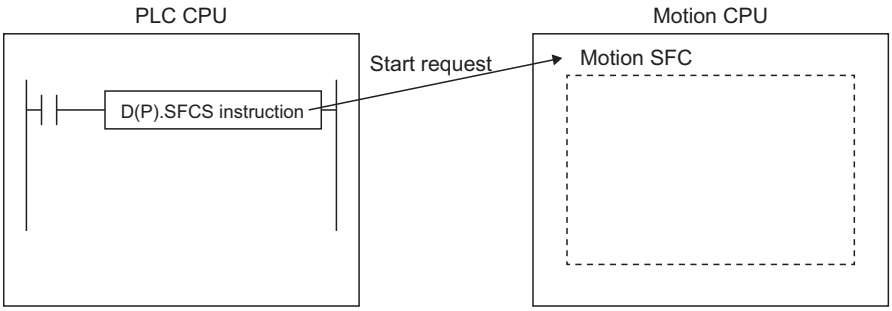
Refer to the following for the details of each instruction. (Control may not be instructed from one Motion CPU to another Motion CPU.)

MELSEC iQ-R Motion controller Programming Manual (Program Design)

Instruction name		Description
M(P).□	D(P).□	
M(P).SFCS	D(P).SFCS	Start request of the Motion SFC program (Program No. may be specified.)
M(P).SVST	D(P).SVST	Start request of the specified servo program
M(P).SVSTD	D(P).SVSTD	Direct positioning start request
M(P).CHGA	D(P).CHGA	Current value change request of the specified axis
M(P).CHGAS	D(P).CHGAS	Current value change request of the specified command generation axis
M(P).CHGV	D(P).CHGV	Speed change request of the specified axis
M(P).CHGVS	D(P).CHGVS	Speed change request of the specified command generation axis
M(P).CHGT	D(P).CHGT	Torque control value change request of the specified axis
M(P).GINT	D(P).GINT	Execute request of an event task to the other CPU (Motion CPU)
M(P).DDWR	D(P).DDWR	Write device data of the self CPU (PLC CPU) to the device of other CPU (Motion CPU)
M(P).DDRD	D(P).DDRD	Read device data of other CPU (Motion CPU) to the device of self CPU (PLC CPU)
M(P).BITWR	D(P).BITWR	Write bit operation to the bit device of another Motion CPU

For example, by using the D(P).SFCS instruction of Motion dedicated PLC instruction, the Motion SFC of the Motion CPU can be started from the PLC CPU.

Ex.



2 COMMON PARAMETERS

2.1 Parameters Used by the Motion CPU

The parameters used by the Motion CPU are as follows.

Parameter	Details
R series common parameters	Common parameters for R series CPU modules
Motion CPU common parameters	Common parameters for Motion CPU modules
Motion control parameters	Positioning control parameters and synchronous control parameters used by the Motion CPU for Motion control

A list of parameters used by the Motion CPU is shown below.

○: Input, ×: Not input

Parameter item		Parameter input timing		Details	Reference
		At ON/reset of Multiple CPU system power supply	At STOP to RUN/test mode request		
R series common parameter	System parameter	○	×	Set the R series CPU common parameters for the base, slot, and module settings and the Multiple CPU system settings. The system parameters for each CPU in the Multiple CPU system must be matched.	☞ Page 46 System parameter
	CPU parameter	○	×		☞ Page 48 CPU parameter
	Module parameter	○	×		☞ Page 52 Module Parameter
Motion CPU common parameter	Basic setting	○	×	Set the basic parameters of the Motion system, such as operation cycle and the external forced stop input.	☞ Page 54 Basic setting
	Servo network setting	○	×	Set the servo network type, the connected servo amplifier, and the SSCNETⅢ/H head module.	☞ Page 56 Servo network setting
	Limit output data	○	○	Set the output device and watch data for limit output.	☞ Page 81 Limit output data setting
	High-speed input request signal	○	×	Set the high precision input request signal used for advanced synchronous control or mark detection.	☞ Page 86 High-speed input request signal setting
	Mark detection	○	×	Set the data for mark detection.	☞ Page 91 Mark detection setting
	Manual pulse generator connection setting	○	×	Set the data required for connecting the manual pulse generator to the module.	☞ Page 61 Manual pulse generator connection setting
	Vision system parameter	×	○	Set the parameters used for connecting the vision system.	☞ Page 195 Vision system parameter setting
	Head module	○	×	Set the parameters used for connecting the SSCNETⅢ/H head module.	☞ Page 142 SSCNETIII/H head module parameters
	Refresh (END/I45 executing) setting	○	×	Set the Multiple CPU refresh (main cycle/ operation cycle).	☞ Page 28 Multiple CPU refresh setting ☞ Page 46 System parameter

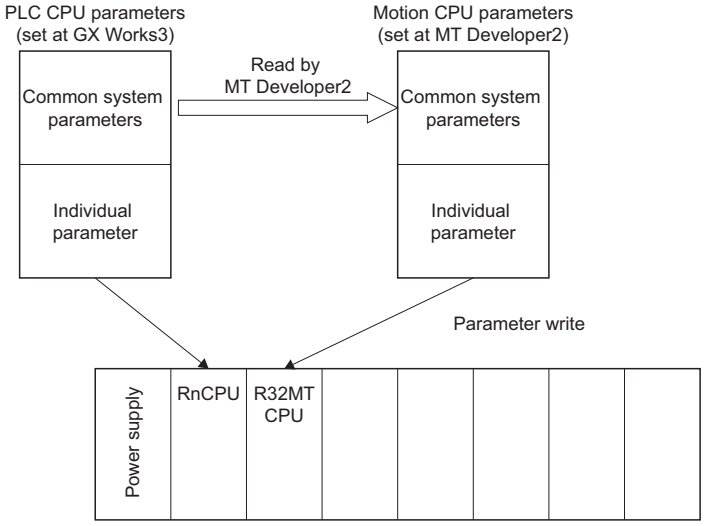
Parameter item			Parameter input timing		Details	Reference
			At ON/reset of Multiple CPU system power supply	At STOP to RUN/test mode request		
Motion control parameter	Axis setting parameter	Fixed parameter	○	×	Set the fixed data based on the mechanical system, etc. of the controlled axis.	*1
		Home position return data	○	×	Set the data required for the home position return.	
		JOG operation data	○	○	Set the data to perform the JOG operation.	
		External signal parameter	○	×	Set the external signals (upper stroke limit (FLS), lower stroke limit (RLS), stop (STOP), and proximity dog or speed/position switching (DOG/CHANGE)) used for each axis.	
		Expansion parameter	○	○	Set when the following functions are used. • Individual monitoring of positive and negative direction torque limit values • Change the acceleration/deceleration time when changing speed • When performing positioning control in the absolute data method in degrees, specify the positioning direction.	
		Speed-torque control data	○	×	Set when the speed-torque control is performed.	
		Optional data monitor	○	×	Set the type of the monitored data and the storage device when the servo amplifier status, etc. is monitored.	☞ Page 120 Optional data monitor setting
		Pressure control data	○	×	Set when performing pressure control that uses a profile.	*1
		Override data	○	×	Set when using the override function.	
		Vibration suppression command filter data	○	×	Set when using vibration suppression command filter function.	
	Servo parameter		○	○	Parameters for the servo amplifier are set based on the specifications for the servo amplifier and servo motor.	
	Parameter block		○	○	Set the data for acceleration/deceleration control, etc. used for each positioning processing.	
	Synchronous control parameter	Input axis parameter	○	×	Set the input axis used for advanced synchronous control.	*2
		Synchronous parameter	○	×	Set the synchronous parameters for the output axis used for advanced synchronous control.	
		Multiple CPU advanced synchronous control setting	○	×	Set the master CPU and slave CPU for performing Multiple CPU advanced synchronous control.	

*1 MELSEC iQ-R Motion Controller Programming Manual (Positioning Control)

*2 MELSEC iQ-R Motion controller Programming Manual (Advanced Synchronous Control)

2.2 R Series Common Parameter

Set the MELSEC iQ-R series CPU module common parameters used at the Multiple CPU system for the R series common parameters.

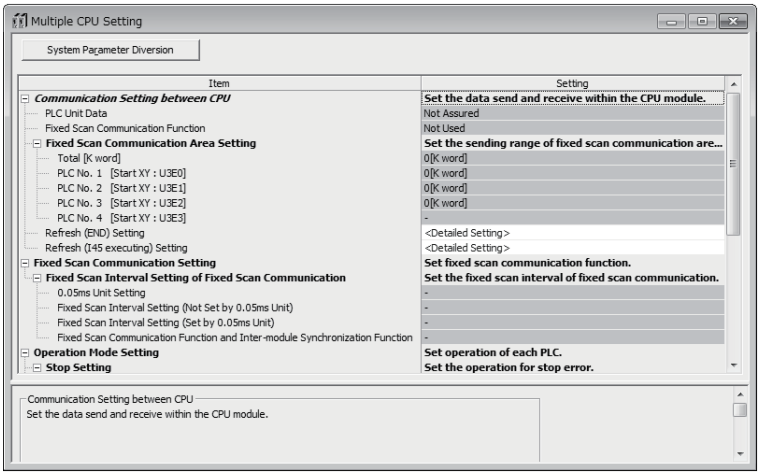


System parameter

These parameters are used to set the Multiple CPU system module configuration and common system items. The system parameters for each CPU in the Multiple CPU system must be matched. There is no need to set system parameters because the parameters set in the GX Works3 "Module Configuration" or "System Parameter" are read by MT Developer2. However, the "Refresh (END) setting", "Refresh (I45 executing) setting", and "Q compatibility high-speed refresh setting" in the communication setting between CPU can be set based on the Motion CPU settings.

[R Series Common Parameter] → [System Parameter] → [Multiple CPU Setting] → "Communication Setting between CPU"

Window


Multiple CPU Setting
System Parameter Diversion
Item
Setting
Communication Setting between CPU
Set the data send and receive within the CPU module.
PLC Unit Data
Not Assured
Fixed Scan Communication Function
Not Used
Fixed Scan Communication Area Setting
Set the sending range of fixed scan communication are...
Total [K word]
0[K word]
PLC No. 1 [Start XY : U3E0]
0[K word]
PLC No. 2 [Start XY : U3E1]
0[K word]
PLC No. 3 [Start XY : U3E2]
0[K word]
PLC No. 4 [Start XY : U3E3]
-
Refresh (END) Setting
<Detailed Setting>
Refresh (I45 executing) Setting
<Detailed Setting>
Fixed Scan Communication Setting
Set fixed scan communication function.
Fixed Scan Interval Setting of Fixed Scan Communication
Set the fixed scan interval of fixed scan communication.
0.05ms Unit Setting
-
Fixed Scan Interval Setting (Not Set by 0.05ms Unit)
-
Fixed Scan Interval Setting (Set by 0.05ms Unit)
-
Fixed Scan Communication Function and Inter-module Synchronization Function
-
Operation Mode Setting
Set operation of each PLC.
Stop Setting
Set the operation for stop error.
Communication Setting between CPU
Set the data send and receive within the CPU module.

Displayed items

Item			Setting range	Default
Multiple CPU setting	Communication setting between CPU	Refresh (END) setting*1	Up to 32 settings for each CPU No. of points: Refer to device list for allowable setting range. (☞ Page 66 Device List) Start: Usable devices (X, Y, M, B, D, W, #)	No setting
		Refresh (I45 executing) setting	Up to 32 settings for each CPU No. of points: Refer to device list for allowable setting range. (☞ Page 66 Device List) Start: Usable devices (X, Y, M, B, D, W, #)	No setting

*1 Q compatibility high-speed refresh setting

Setting range	Default
Up to 128 settings for each CPU No. of points: 2 to 256 Start: Usable devices (X, Y, M, B, D, W, #)	No setting

Communication setting between CPU

■Refresh (END) setting

Set up to 32 settings for refresh device per CPU. Refer to device list for the range of devices that can be set. (☞ Page 66 Device List)

- Q compatibility high-speed refresh setting

  Set refresh between CPUs with up to of 128 settings for the entire Multiple CPU system. Set 2 points (words) or more each, and no more than 256 points in total. Refer to device list for the range of devices that can be set. (☞ Page 66 Device List)

■Refresh (I45 executing)

Set up to 32 settings for refresh device per CPU. Refer to device list for the range of devices that can be set. (☞ Page 66 Device List)

Point

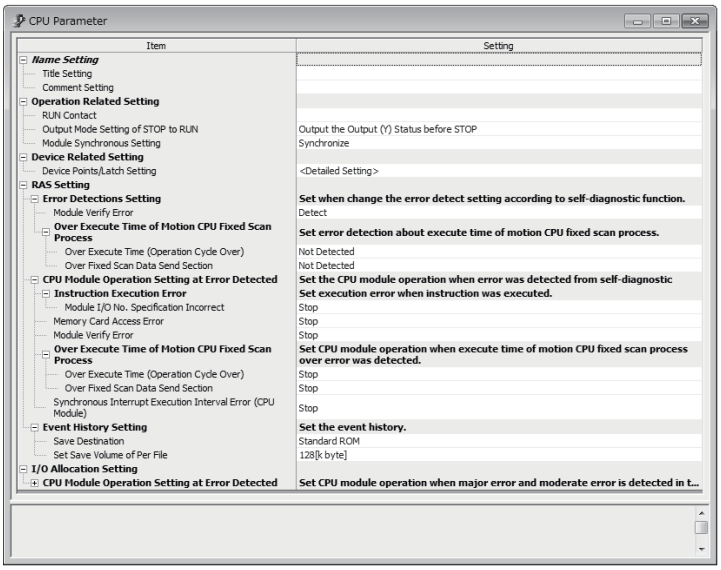
- Refer to Multiple CPU refresh setting for details on the Refresh (at END) and Refresh (I45 executing) settings. (☞ Page 28 Multiple CPU refresh setting, ☞ Page 30 Multiple CPU refresh setting (Q compatibility high-speed refresh setting))
- If using the CPU fixed scan communication function set at GX Works3, or the inter-module synchronization function, set the cycles that can be set at the Motion CPU (0.222ms/0.444ms/0.888ms/1.777ms/3.555ms/7.111ms) for the fixed scan communication cycle or inter-module synchronization cycle. A moderate error (error code: 2222H) occurs if a cycle other than the above cycles is set. Refer to relationship between fixed scan communication and inter-module synchronization for details on the relationship with motion operation cycle settings. (☞ Page 41 Relationship between fixed scan communication and inter-module synchronization)

CPU parameter

Set the operational details for the Motion CPU's functions. Also, regarding the overall system, settings for which verification between CPUs is not necessary are also stored in these parameters.

[R Series Common Parameter] → [Motion CPU Module] → [CPU Parameter]

Window


CPU Parameter
Item
Setting
Name Setting
Title Setting
Comment Setting
Operation Related Setting
RUN Contact
Output Mode Setting of STOP to RUN
Output the Output (Y) Status before STOP
Module Synchronous Setting
Synchronize
Device Related Setting
Device Points/Latch Setting
<Detailed Setting>
RAS Setting
Error Detections Setting
Set when change the error detect setting according to self-diagnostic function.
Module Verify Error
Detect
Over Execute Time of Motion CPU Fixed Scan Process
Set error detection about execute time of motion CPU fixed scan process.
Over Execute Time (Operation Cycle Over)
Not Detected
Over Fixed Scan Data Send Section
Not Detected
CPU Module Operation Setting at Error Detected
Set the CPU module operation when error was detected from self-diagnostic
Instruction Execution Error
Set execution error when instruction was executed.
Module I/O No. Specification Incorrect
Stop
Memory Card Access Error
Stop
Module Verify Error
Stop
Over Execute Time of Motion CPU Fixed Scan Process
Set CPU module operation when execute time of motion CPU fixed scan process over error was detected.
Over Execute Time (Operation Cycle Over)
Stop
Over Fixed Scan Data Send Section
Stop
Synchronous Interrupt Execution Interval Error (CPU Module)
Stop
Event History Setting
Set the event history.
Save Destination
Standard ROM
Set Save Volume of Per File
128[k byte]
I/O Allocation Setting
CPU Module Operation Setting at Error Detected
Set CPU module operation when major error and moderate error is detected in t...

Displayed items

Item		Setting range	Default value
Name setting	Title setting	Up to 32 characters	No setting
	Comment setting	Up to 256 characters	No setting
Operation related setting	RUN contact	X0 to X2FFF	No setting
	Output mode setting of STOP to RUN	Output the output (Y) status before STOP/Clear the output (Y) (output is 1 scan later)	Output the output (Y) status before STOP
	Module synchronous setting	Synchronize/Do not synchronize	Synchronize
Device related setting	Device points	Bit device (M, B, F)/Word device (D, W, #)	☞ Page 73 Device Setting
	Latch setting	Up to 32 settings	No setting

Item				Setting range	Default value
RAS setting	Error detections setting	Module verify error		Detect/Not detected	Detect
		Over execute time of Motion CPU fixed scan process	Over execute time (operation cycle over)	Detect/Not detected	Not detected
			Over fixed scan data send section	Detect/Not detected	Not detected
	CPU module operation setting at error detected	Instruction execution error module I/O No. specification incorrect		Stop/Continue	Stop
		Memory card access error		Stop/Continue	Stop
		Module verify error		Stop/Continue	Stop
		Over execute time of Motion CPU fixed scan process	Over execute time (operation cycle over)	Stop/Continue	Stop
			Over fixed scan data send section	Stop/Continue	Stop
		Synchronous interrupt execution interval error (CPU module)		Stop/Continue	Stop
	Event history setting	Save destination		SD memory card/Standard ROM	Standard ROM
		Set save volume of per file		1 to 2048[k bytes]	128[k bytes]
I/O assignment setting	CPU module operation setting at error detected	Slot 0 to 63		Major: Stop, Moderate: Stop/Major: Stop, Moderate: Continue/Major: Continue, Moderate: Continue	Major: Stop, Moderate: Continue

Name setting

■Title setting

Set the Motion CPU title (name, application). Up to 32 characters can be set.

■Comment setting

Set a comment for the title. Up to 256 characters can be set.

Operation related setting

■RUN contact

Set contacts used to control Motion CPU RUN signals. Only inputs (X) can be set.

Setting range
X0 to X2FFF

Refer to remote RUN/STOP for details on operation with RUN contacts. (☞ Page 181 Remote RUN/STOP)

■Output mode setting of STOP to RUN

Set the output (Y) operation when switching from the STOP status to RUN status.

- Output the output (Y) status before STOP: If outputting the output (Y) status before STOP
- Clear the output (Y) (output 1 scan later) : If clearing the output (Y) status and outputting 1 scan later

■Module synchronous setting

Set whether or not to synchronize Motion CPU and intelligent function module startup.

- Synchronize: Synchronizes startup.
- Do not synchronize: Does not synchronize startup.

Device related setting

■Device points

Set the range for the number of points for each device.

Refer to device setting for details on the number of devices setting. (☞ Page 73 Device Setting)

Refer to device list for the range of devices that can be set. (☞ Page 66 Device List)

Settable devices
M, B, F, D, W, #

■Latch setting

Set the device (M, B, F, D, W, #) latch range. Up to 32 devices can be set for the latch (1) and latch (2) latch range. Refer to latch function for details on the latch range setting. (☞ Page 75 Latch Function)

Refer to device list for the range of devices that can be set. (☞ Page 66 Device List)

RAS setting

■Error detections setting

- Module verify error

  Set whether to "Detect" or "Not detect" module comparison errors in cases such as when a different module is detected when the Multiple CPU system power supply is ON.
- Over execute time of Motion CPU fixed scan process
  - Over execute time (operation cycle over)

    Set whether to "Detect" or "Not detect" Motion CPU fixed-cycle processing execution time over conditions.
  - Over fixed scan data send section

    Set whether to "Detect" or "Not detect" errors if Motion CPU fixed-cycle processing is not complete by the time fixed scan data communication to another CPU starts.

■CPU module operation setting at error detected

- Instruction execution error module I/O No. specification incorrect

  Set whether to "Stop" or "Continue" Motion CPU processing if a module I/O No. specification incorrect error is detected.
- Memory card access error

  Set whether to "Stop" or "Continue" Motion CPU processing if a memory card access error is detected.
- Module verify error

  Set whether to "Stop" or "Continue" Motion CPU processing if a module comparison error is detected.
- Over execute time of Motion CPU fixed scan process
  - Over execute time (operation cycle over)

    Set whether to "Stop" or "Continue" Motion CPU processing if a Motion CPU fixed-cycle processing operation cycle over condition is detected.
  - Over fixed scan data send section

    Set whether to "Stop" or "Continue" Motion CPU processing if a Motion CPU fixed-cycle processing fixed scan data communication section over condition is detected.
- Synchronous interrupt execution interval error (CPU module)

  Set whether to "Stop" or "Continue" Motion CPU processing if the Motion CPU detects a synchronous signal error.

■Event history setting

- Save destination

  Set the storage destination for event history files.
  - SD memory card
  - Standard ROM
- Set save volume of per file

  Set the saving volume per event history file.

Setting range
1 to 2048[k bytes]

I/O assignment setting

■CPU module operation setting at error detected

Set the CPU module operation mode during error for slot 0 to slot 63.

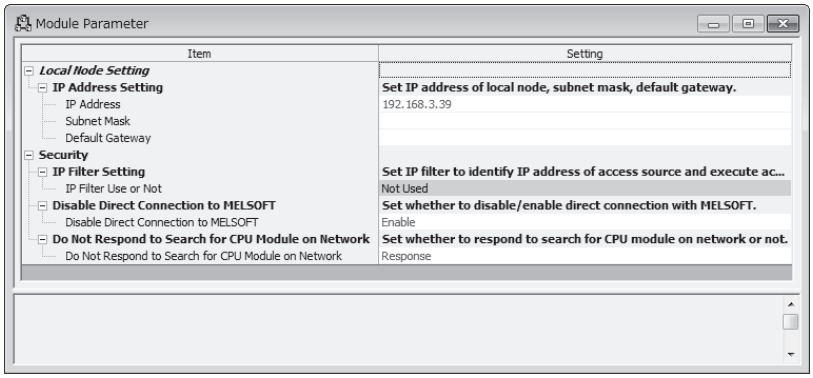
- Major: Stop, Moderate: Stop
- Major: Stop, Moderate: Continue
- Major: Continue, Moderate: Continue

Module Parameter

Specify local node settings and security in order to communicate with external devices with the Motion CPU PERIPHERAL I/F.

[R Series Common Parameter] → [Motion CPU Module] → [Module Parameter]

Window


Module Parameter
Item
Setting
Local Node Setting
IP Address Setting
Set IP address of local node, subnet mask, default gateway.
IP Address
192.168.3.39
Subnet Mask
Default Gateway
Security
IP Filter Setting
Set IP filter to identify IP address of access source and execute ac...
IP Filter Use or Not
Not Used
Disable Direct Connection to MELSOFT
Set whether to disable/enable direct connection with MELSOFT.
Disable Direct Connection to MELSOFT
Enable
Do Not Respond to Search for CPU Module on Network
Set whether to respond to search for CPU module on network or not.
Do Not Respond to Search for CPU Module on Network
Response

Displayed items

Item			Setting range	Default value
Local node setting	IP address setting	IP address	0.0.0.1 to 223.255.255.254	192.168.3.39
		Subnet mask	0.0.0.1 to 255.255.255.254/blank	No setting
		Default gateway	0.0.0.1 to 255.255.255.254/blank	No setting
Security	IP filter setting	IP filter use or not	Use/Not used	Not used
		IP filter setting	Up to 32 settings	No setting
	Disable direct connection to MELSOFT		Enable/Disable	Enable
	Do not respond to search for CPU module on network		Response (no check)/Not responded (check)	Response (no check)

Local node setting

■IP address setting

- IP address

  Set the local node IP address.
- Subnet mask

  Set the IP address in order to set which upper bit to use for the network address to identify the network.
- Default gateway

  Set the IP address for the passing device (default gateway) used to access the network device to which the local node belongs.

Security

■IP filter setting

Data set at GX Works3 is read by MT Developer2, and therefore there is no need to set the IP filter.

■Disable direct connection to MELSOFT

Set whether to "Enable" or "Disable" a direct connection (simple connection) with the Engineering Tool.

■Do not respond to search for CPU module on network

Set whether to "Respond" or "Not respond" to an Engineering Tool network CPU module search.

2.3 Motion CPU Common Parameter

The Motion CPU common parameters are used to specify Motion CPU basic settings, the servo network configuration, and all auxiliary functions. A list of Motion CPU common parameter settings is shown in the table below.

Item				Setting range	Default value	Remark
Basic setting	Operation cycle			0.222ms/0.444ms/0.888ms/1.777ms/ 3.555ms/7.111ms/Default setting	Default setting	Set the operation cycle of motion control.
	Forced stop input setting	Instruction		Not used/Used	Not used	Set the bit device to use for the forced stop.
		Device		Bit device	Not setting	
	File transmission setting during booting			Standard ROM write permission/read protection/ Standard ROM write protection/read protection/ Standard ROM write protection/read permission/ Standard ROM write permission/read protection/Boot operation file invalid	Standard ROM write permission / read protection	Set whether to permit/protect file transmission at boot
Servo network setting	SSCNET setting	Communication type		SSCNETⅢ/H/SSCNETⅢ	SSCNETⅢ/H	Set the communication type for every line.
	Amplifier setting	Amplifier information	Amplifier model	<Communication type "SSCNETⅢ/H" use> MR-J4(W)-B(-RJ)/MR-J4-B-LL/ VCⅡ (Nikki Denso) /LJ72MS15	MR-J4(W)-B(-RJ)	Set the model name, axis No. and other details for the servo amplifiers.
				<Communication type "SSCNETⅢ" use> MR-J3(W)-B/MR-J3-B(S) Fully closed/MR-J3(W)-B Linear/MR-J3(W)-B DD motor/MR-MT1200/FR-A700/FR-A700-NA/FR-A700-EC/FR-A700-CHT/VCⅡ (Nikki Denso)	MR-J3(W)-B	
			Amplifier operation mode	<Communication type "SSCNETⅢ/H" use> Standard/Fully closed/Linear/DD motor	Standard	
		Axis information	Axis No.	R32MTCPU: Up to 2 lines, 32 axes R16MTCPU: Up to 1 line, 16 axes	No setting	
			RIO axis No.*1	<Communication type "SSCNETⅢ/H" use> R32MTCPU: Up to 2 lines, 8 axes R16MTCPU: Up to 1 line, 4 axes	No setting	
			Station No.d	<Communication type "SSCNETⅢ/H" use> 1 to 64	No setting	
			Axis label/ RIO axis label*1	Up to 32 characters	No setting	
		External synchronous encoder input*2		Invalid/ABS/INC	Invalid	
		Input filter setting		Nothing/0.8ms/1.7ms/2.6ms/3.5ms	3.5ms	
		Allowable travel during Power-Off		<Communication type "SSCNETⅢ" use> 0 to 8191 revolution	10	
Limit output data				Set 1 to 64	No setting	☞ Page 81 Limit output data setting
High-speed input request signal				Set 1 to 64	No setting	☞ Page 86 High-speed input request signal setting
Mark detection				Set 1 to 32	No setting	☞ Page 91 Mark detection setting
Manual pulse generator connection setting				Set P1 to P3	No setting	☞ Page 61 Manual pulse generator connection setting
Vision system parameter	Ethernet communication line			Vision system No. 1 to 32	No setting	☞ Page 195 Ethernet Communication Line Setting
	Vision program operation			Program No. 1 to 128	No setting	☞ Page 198 Vision Program Operation Setting
Head module				Set module 1 to 4 for each line. R32MTCPU: 2 lines (Up to 8 modules) R16MTCPU: 1 line (Up to 4 modules)	No setting	☞ Page 142 Parameter setting of SSCNETIII/H head module

*1 This is the RIO-axis when "LJ72MS15" is selected for the amplifier model.

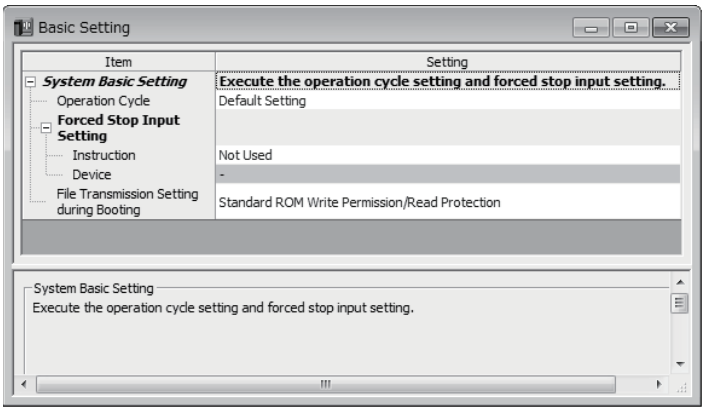
*2 This can only be set when "MR-J4(W)-B(-RJ)" is selected for the amplifier model.

Basic setting

The following explains each item to be set in basic setting.

[Motion CPU Common Parameter] → [Basic setting]

Window



Displayed items

Item		Setting range	Default value
Operation cycle		0.222ms/0.444ms/0.888ms/1.777ms/3.555ms/7.111ms/Default setting	Default setting
Forced stop input setting	Instruction	Not used/Used	Not used
	Device	Bit device	No setting
File transmission setting during booting		Standard ROM write permission/read protection/ Standard ROM write protection/read protection/ Standard ROM write protection/read permission/ Standard ROM write permission/read permission/Boot operation file invalid	Standard ROM write permission/read protection

Operation cycle

- Set the of motion operation cycle (cycles at which a position command is computed and sent to the servo amplifier).
- The default value is "Default Setting". The operation cycle is set according to the table below based on the number of axes for servo amplifier set in the servo network setting.

Number of axes	Operation cycle setting
1 to 2 axes	0.222ms
3 to 8 axes	0.444ms
9 to 20 axes	0.888ms
21 to 32 axes	1.777ms

- If the duration of motion operation has exceeded the operation cycle, the "[St.1046] Operation cycle over flag (M2054)" turns ON. (☞ Page 243 Processing time monitor and check)
- The number of stations capable of connecting to the SSCNETⅢ(/H) 1 line is limited based on the motion operation cycle. Refer to the following for details on restrictions based on the communication methods and operation cycles used.
  MELSEC iQ-R Motion Controller User's Manual

Forced stop input setting

Set the bit device used for the forced stop to perform a forced stop for all servo amplifier axes together. Refer to device list for the range of bit devices that can be set. (☞ Page 66 Device List)

No default value has been set. The set bit device is designated as contact B and performs the following control in response to ON/OFF of the device.

Bit device	Details
Bit device is turned OFF	Forced stop input is ON (forced stop)
Bit device is turned ON	Forced stop input is OFF (forced stop is released.)

File transmission setting during booting

Set the operation for performing the file transmission at boot function.

Refer to file transmission at boot function for details of the file transmission at boot function. (☞ Page 107 File Transmission at Boot Function)

The file transmission at boot settings from the last time power supply was shutoff are valid when the power supply of the Multiple CPU system is turned ON.

Setting	Details
Standard ROM write permission/read protection	• Moving or copying to the standard ROM is permitted for files saved outside of the standard ROM. • Moving or copying out of the standard ROM is protected for files saved in the standard ROM.
Standard ROM write protection/read protection	• Moving or copying to the standard ROM is protected for files saved outside of the standard ROM. • Moving or copying out of the standard ROM is protected for files saved in the standard ROM.
Standard ROM write protection/read permission	• Moving or copying to the standard ROM is protected for files saved outside of the standard ROM. • Moving or copying out of the standard ROM is permitted for files saved in the standard ROM.
Standard ROM write permission/read protection	• Moving or copying to the standard ROM is permitted for files saved outside of the standard ROM. • Moving or copying out of the standard ROM is permitted for files saved in the standard ROM.
Boot operation file invalid	File transmission at boot function cannot be used.

Point

The file transmission at boot settings at the time of when Multiple CPU system power supply is turned ON are stored in "Boot file transfer information (SD509)".

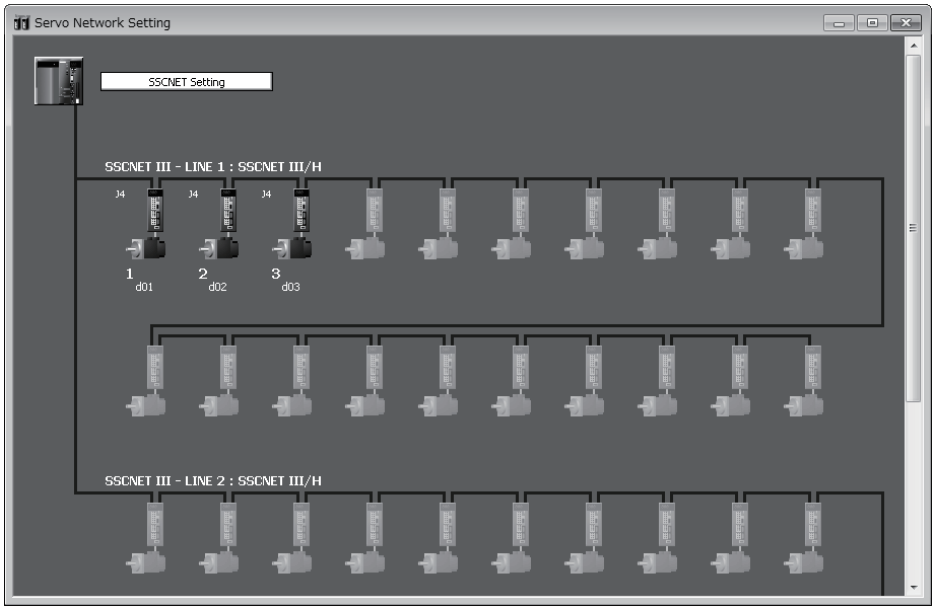
Refer to special registers for details on special registers. (☞ Page 300 Special Registers)

Servo network setting

The following explains each item to be set in servo network setting.

[Motion CPU Common Parameter] → [Servo network setting]

Window



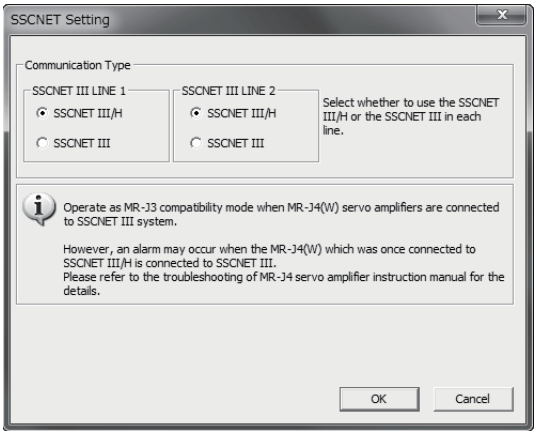
Displayed items

Item	Setting range
SSCNET setting	☞ Page 57 SSCNET setting
Amplifier setting	☞ Page 58 Amplifier setting

SSCNET setting

[Motion CPU Common Parameter] → [Servo network setting] → [SSCNET Setting]

Window


SSCNET Setting
Communication Type
SSCNET III LINE 1
SSCNET III/H
SSCNET III
SSCNET III LINE 2
SSCNET III/H
SSCNET III
Select whether to use the SSCNET III/H or the SSCNET III in each line.
Operate as MR-J3 compatibility mode when MR-J4(W) servo amplifiers are connected to SSCNET III system.
However, an alarm may occur when the MR-J4(W) which was once connected to SSCNET III/H is connected to SSCNET III.
Please refer to the troubleshooting of MR-J4 servo amplifier instruction manual for the details.
OK
Cancel

Displayed items

Item	Setting range	Default value
Communication type	SSCNETⅢ/H/SSCNETⅢ	SSCNETⅢ/H

■Communication type

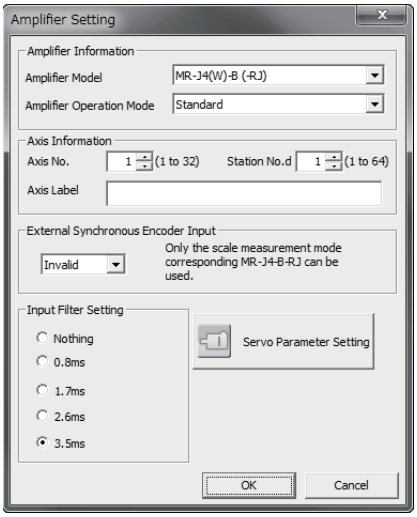
Set the communication type to communicate with the servo amplifier for every line.

- SSCNETⅢ/H: MR-J4(W)-□B
- SSCNETⅢ: MR-J3(W)-□B

Amplifier setting

[Motion CPU Common Parameter] → [Servo network setting] → [Amplifier Setting]

Window



Displayed items

Item		Setting range	Default value
Amplifier information	Amplifier model	<Communication type "SSCNETⅢ/H" use> MR-J4(W)-B(-RJ)/MR-J4-B-LL/VCⅡ (Nikki Denso) /LJ72MS15	MR-J4(W)-B(-RJ)
		<Communication type "SSCNETⅢ" use> MR-J3(W)-B/MR-J3-B(S) Fully closed/MR-J3(W)-B Linear/MR-J3(W)-B DD motor/MR-MT1200/FR-A700/FR-A700-NA/FR-A700-EC/FR-A700-CHT/VCⅡ (Nikki Denso)	MR-J3(W)-B
	Amplifier operation mode*1	<Communication type "SSCNETⅢ/H" use> Standard/Fully closed/Linear/DD motor	Standard
Axis information	Axis No.	R32MTCPU: Up to 2 lines, 32 axes R16MTCPU: Up to 1 line, 16 axes	No setting
	RIO axis No.*2	<Communication type "SSCNETⅢ/H" use> R32MTCPU: Up to 2 lines, 8 axes R16MTCPU: Up to 1 line, 4 axes	No setting
	Station No.d	<Communication type "SSCNETⅢ/H" use> 1 to 64	No setting
	Axis label/RIO axis label*2	Up to 32 characters	No setting
External synchronous encoder input*1		Invalid/ABS/INC	Invalid
Input filter setting		Nothing/0.8ms/1.7ms/2.6ms/3.5ms	3.5ms
Allowable travel during Power-Off		<Communication type "SSCNETⅢ" use> 0 to 8191 revolution	10

*1 This can only be set when "MR-J4(W)-B(-RJ)" is selected for the amplifier model.

*2 This is the RIO-axis when "LJ72MS15" is selected for the amplifier model.

■Amplifier information

Set the amplifier model and amplifier operation mode.

• Amplifier model

Communication type	Amplifier model
When "SSCNETⅢ/H" is set	• MR-J4(W)-B(-RJ) • MR-J4-B-LL • VCⅡ (Nikki Denso) • LJ72MS5
When "SSCNETⅢ" is set	• MR-J3(W)-B • MR-J3-B(S) fully closed • MR-J3(W)-B linear • MR-J3(W)-B DD motor • MR-MT1200 • FR-A700 • FR-A700-NA • FR-A700-EC • FR-A700-CHT • VCⅡ (Nikki Denso)

• Amplifier operation mode

Set the amplifier operation mode only when "MR-J4(W)-B(-RJ)" is selected for the amplifier model.

Amplifier model	Amplifier operation mode
MR-J4(W)-B(-RJ)	• Standard • Fully closed • Linear • DD motor

■Axis information

Set the axis No., station No., and axis label used to identify the servo amplifier.

• Axis No.

Set the axis No. for each line used by the Motion CPU to identify the servo amplifier.

Motion CPU	Axis No. setting range
R32MTCPU	1 to 32
R16MTCPU	1 to 16

• RIO Axis No.

Set the RIO axis No. used by the Motion CPU to identify the remote I/O only when "LJ72MS15" is selected for the amplifier model.

Motion CPU	Axis No. setting range
R32MTCPU	601 to 608
R16MTCPU	601 to 604

• Station No. d

Set the station No. set with the servo amplifier rotary switch for each line.

Communication type	Station No. setting range
When "SSCNETⅢ/H" is set	1 to 64
When "SSCNETⅢ" is set	1 to 16

• Axis label/RIO label

Set an axis label of up to 32 characters for the set axis/RIO axis. This is the RIO axis label when "LJ72MS15" is selected for the amplifier model.

■External synchronous encoder input

Set external synchronous encoder input when "MR-J4(W)-B(-RJ)" is selected for the amplifier model.

■Input filter setting

Set the signal input filter time for the servo amplifier with external input signal.

■Allowable travel during power off

Set only when "MR-J3(W)-B" or "MR-J3-B(S) fully closed" is selected for the amplifier model when communication type "SSCNETⅢ" is selected. If the motor travel distance when the servo amplifier control circuit power supply is OFF exceeds the permissible travel amount when power supply off, a warning (error code: 093FH) occurs.

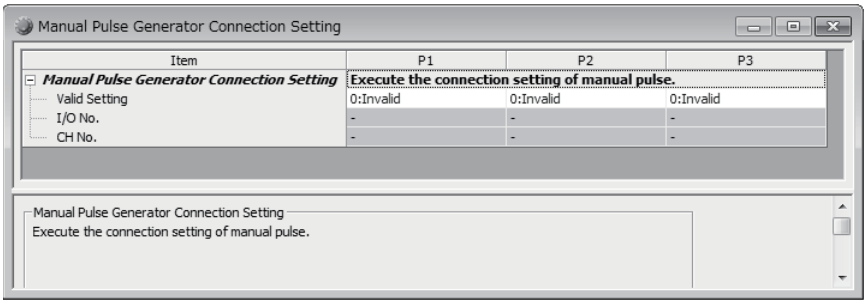
Setting range
0 to 8191

Manual pulse generator connection setting

This section describes the manual pulse generator connection setting items.

[Motion CPU Common Parameter] → [Manual Pulse Generator Connection Setting]

Window



Displayed items

Item	Setting range	Default value
Valid setting	0: Invalid/1: Valid	0: Invalid
I/O No.	H0000 to H0FF0	No setting
CH No.	1 to 2	No setting

Valid setting

Enable/disable the manual pulse generator (P1 to P3).

Setting range	Details
0: Invalid	Does not connect the manual pulse generator (P1 to P3).
1: Valid	Connects the manual pulse generator (P1 to P3).

I/O No.

Set the start I/O No. for the high-speed counter module used to connect the manual pulse generator. Set the high-speed counter module as the Motion CPU management module in the GX Works3 "System Parameters" → "I/O Assignment Setting".

Setting range
H0000 to H0FF0

CH No.

Set the channel number for the high-speed counter module used to connect the manual pulse generator. The same channel number for the same module can be set to overlap in manual pulse generator (P1 to P3).

Setting range
1 to 2

Point

Refer to the following for details on the manual pulse generator.

MELSEC iQ-R Motion Controller Programming Manual (Positioning Control)

2.4 Motion CPU Operating Status

This section describes the Motion CPU operating status and details of all processes. The operation for when the Motion CPU is started with the rotary switch set to "0: Normal mode" are shown below. Refer to each function for details on operation when started with rotary switch set to other than "0: Normal mode".

Initial processing

Initial processing the pre-processing used to start Motion CPU control. Initial processing is performed once only when the CPU module status is one of those shown in the table below. When initial processing is complete, the Motion CPU transitions to the operating status based on "[Rq.1120] PLC ready flag (M2000)". Details of initial process are shown in the table below.
○: Execute, ×: Don't execute

Initial processing item			Motion CPU status		
			When Multiple CPU system power supply turned ON	When resetting Multiple CPU system	At STOP to RUN/ When making test mode request
Executing file transmission at boot			○	○	×
R series common parameters reading and check	System parameter		○	○	×
	CPU parameter				
	Module parameter				
Motion CPU common Parameter reading*1	Motion basic setting		○	○	×
	Servo network setting				
	Limit switch output setting				○
	High-speed input request signal setting				×
	Mark detection setting				
	Manual pulse generator connection setting				
	Vision system parameter		×	×	○
	Head module setting		○	○	×
	Refresh (END/I45 executing) setting				
Motion control Parameter reading*1	Axis setting data	Fixed parameter	○	○	×
		Home position return data			
		JOG operation data			○
		External signal parameter			×
		Expansion parameter			○
		Speed-torque control data			×
		Optional data monitor setting			
		Pressure control data			
		Override data			
		Vibration suppression command filter data			
	Servo parameter				○
	Parameter block				
	Input axis parameter				×
	Synchronous parameter				
System configuration check			○	○	×
I/O module, intelligent function module initialization			○	○	×
Initialization of devices outside latch range			○	○	×
Motion SFC program, servo program reading			○	○	○
Cam data reading			○	○	○

*1 Shows the timing at which data is read from the settings file. Refer to each function for details on the indirect setting data read cycle and data check timing.

Point

Parameter and program content is read from a file and processed as follows until used for control.
(1) Data (programs or parameters) is read from a file.
(2) The read data is extracted to standard memory. (A consistency check is performed if necessary.)
(3) Indirectly set parameter values are read from the device.
(4) The data content is checked. (Value range check, etc.)
(5) Data is then used for control.
The timing of the above steps (1) to (5) may differ depending on the processing. The parameter and program read processing in the table above indicates the timing for steps (1) and (2). Refer to each function for details on the timing of steps (3) to (5).

RUN/STOP status control

STOP/RUN/test mode

When initial processing is complete, the Motion CPU status will be "STOP status", "RUN status", or "Test mode status" depending on the "[Rq.1120] PLC ready flag (M2000)" and existence of a test mode request from MT Developer2, and the respective control will be performed.

Motion CPU processing will be as follows for each operating status.

○: Possible, △: Possible (restrictions apply), ×: Not possible

Processing details		Motion CPU status				
		Stop error		STOP	RUN	Test mode
		Major	Moderate			
Multiple CPU/module control	Input (X) module refresh processing	×	×	○	○	○
	Output (Y) module refresh processing	×	×	△*1	○	○
	Self-diagnosis processing	×	△*2	○	○	○
	Multiple CPU auto refresh	×	×	○	○	△*3
	Multiple CPU clock synchronization	×	△*2	○	○	○
	Error reset	×	×	○	○	○
Program execution/positioning control	Positioning control, home position return, JOG operation, manual pulse generator operation, speed-torque control	×	×	×	○	△*4
	Motion SFC program execution	×	×	×	○	×
	Motion dedicated command accept	×	×	△*5	○	△*5
Synchronous control	Synchronous control operation	×	×	○	○	×
	Synchronous encoder monitor	×	△*2	○	○	○
Communication with peripheral devices	Program/parameter reading	×	△*2	○	○	○
	Program/parameter writing	×	△*2	○	×	×
	Online change	×	△*2	○	○	○
	Device monitor, device test	×	△*2	○	○	○
	Transition to test mode	×	×	○	×	—
	Remote operation request	×	×	○	○	×
	Latch clear	×	△*2	○	×	×
	Memory formatting	×	△*2	○	×	×
SSCNETⅢ(/H) control function	Communication with servo amplifier	×	△*2	△*6	○	○
	Disconnect/disconnect function	×	△*2	○	○	○
	Amplifier-less operation function	×	△*2	○	○	○
	Servo parameter transfer/read/change	×	△*2	○	○	○
	Optional data monitor function	×	△*2	○	○	○
Auxiliary/application function	Limit switch output function	×	△*2	○	○	○
	Mark detection function	×	△*2	○	○	○
	Servo ON/OFF	×	△*2	○	○	○
	Follow-up function	×	△*2	○	○	○
	Digital oscilloscope (online/offline)	×	△*2	○	○	○
File management	SD memory card disable	×	△*2	○	○	○

*1 Refer to "[Rq.1120] PLC ready flag (M2000)" ON → OFF (RUN status → STOP status) processing. (☞ Page 65 "[Rq.1120] PLC ready flag (M2000)" ON -> OFF (RUN status -> STOP status) processing)

*2 Execution may not be possible if an error occurs.

*3 Only transmission refresh is performed.

*4 Refer to test mode for functions that can be used from the MT Developer2 test screen. (☞ Page 208 Test Mode)

*5 Only the M(P).CHGA/D(P).CHGA/M(P).CHGT/D(P).CHGT/D(P).DDWR/M(P).DDWR/D(P).DDRD/M(P).DDRD/M(P).BITWR/D(P).BITWR commands are possible.

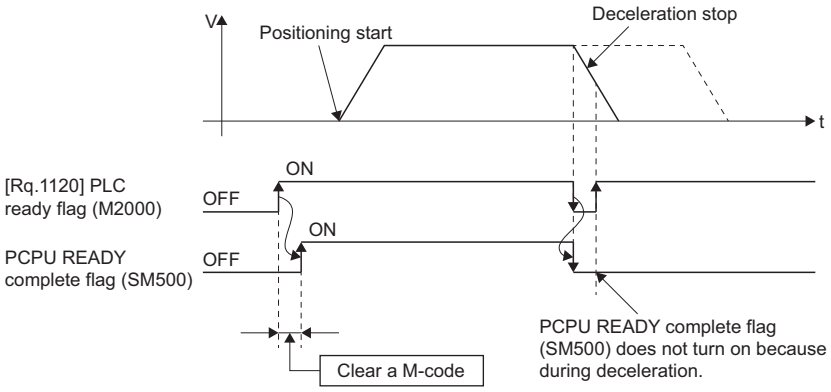
*6 The servo system can be turned ON, however, axes cannot be moved. Furthermore, only position control mode is possible.

"[Rq.1120] PLC ready flag (M2000)" OFF -> ON (STOP status -> RUN status) processing

■Processing details

1. The Y device content is initialized based on the "Output mode setting of STOP to RUN" (Refer to ☞ Page 48 CPU parameter) operation.
2. All parameters are read from a file. (Refer to ☞ Page 62 Initial processing)
3. Clear the M-code storage area of all axes.
4. The "PCPU READY complete flag (SM500)" is turned ON when all of the above steps are complete. (Motion SFC program execution is possible. The execution of automatically started Motion SFC programs is started from the beginning.)

- If there is a starting axis, an error occurs, and the processing above is not executed.
- The processing above is not executed during the test mode. It is executed when the test mode is cancelled and "[Rq.1120] PLC ready flag (M2000)" is ON.



Point

Refer to the following for details on the processing time when the "[Rq.1120] PLC ready flag M2000)" turns from OFF to ON.

📖MELSEC iQ-R Motion Controller Programming Manual (Positioning Control)

"[Rq.1120] PLC ready flag (M2000)" ON -> OFF (RUN status -> STOP status) processing

■Processing details

1. Deceleration stop of the starting axis.
2. Execution of the Motion SFC program is stopped. (The program currently being executed stops at the position where only the set number of consecutive transitions has been executed.)
3. All Y devices are turned OFF. If the "Output mode setting of STOP to RUN" (Refer to ☞ Page 48 CPU parameter) is "output the output (Y) status before STOP", the status prior to clearing is saved. However, the high-speed counter module Y device set for the synchronous encoder or manual pulse generator input does not turn OFF even if the status is STOP.
4. The "PCPU READY complete flag (SM500)" is turned OFF.

Point

- Refer to the following for details on the processing time when the "[Rq.1120] PLC ready flag (M2000)" turns from ON to OFF.
  📖MELSEC iQ-R Motion Controller Programming Manual (Positioning Control)
- Axis stoppage processing when transitioning from the RUN status to STOP status may differ depending on the cause of the stoppage. Refer to the following for details.
  📖MELSEC iQ-R Motion Controller Programming Manual (Positioning Control)

3 DEVICES

This section describes the devices used with the Motion CPU.

3.1 Device List

The following is a list of devices that can be used with the Motion CPU.

○: Setting possible, ×: Setting not possible

Category	Type	Device name	Device range			Word device Bit designation*1	Latch setting*2
			No. of points	Setting range	Notation		
User device	Bit device	Input (X)	12288 points (12k)*3	X0 to X2FFF	Hexadecimal	—	×
		Output (Y)	12288 points (12k)*3	Y0 to Y2FFF	Hexadecimal		
		Internal relay (M)	12288 points (12k)*4*5	M0 to M12287	Decimal		○
		Link relay (B)	8192 points (8k)*4	B0 to B1FFF	Hexadecimal		
		Annunciator (F)	2048 points (2k)*4	F0 to F2047	Decimal		
	Word device	Data register (D)	20480 points (20k)*4*5	D0 to D20479	Decimal	○	
		Link register (W)	8192 points (8k)*4	W0 to W1FFF	Hexadecimal		
		Motion register (#)	12288 points (12k)*4	#0 to #12287	Decimal		
System device	Bit device	Special relay (SM)	4096 points	SM0 to SM4095	Decimal	—	×
	Word device	Special register (SD)	4096 points	SD0 to SD4095	Decimal	○	
CPU buffer memory access device	Word device	CPU buffer memory access device	Up to 2097152 (2M)	U3E□\G0 to U3E□\G2097151*6*7	Decimal		
		CPU buffer memory access device (fixed scan communication area)	Up to 12288 points (12k)*8	U3E□\HG0 to U3E□\HG12287*6	Decimal		
Module access device	Word device	Module access device	Up to 268435456 points (256M)	U□\G0 to U□G268435455*9	Decimal		
Constant	16-bit integer type	Decimal notation	K-32768 to K32767				
		Hexadecimal notation	H0 to HFFFF				
	32-bit integer type	Decimal notation	K-2147483648L to K2147483647L				
		Hexadecimal notation	H0L to HFFFFFFFFL				
	64-bit floating-point type	Decimal notation	K-1.79E+308 to K-2.23E-308 K0.0 K2.23E-308 to K1.79E+308				

*1 The description for word device bit designation is "Device No. n (n = bit No.: 0 to F)".
(Example) "W100.A" indicates W100 bit A.

*2 Refer to latch function for details on the latch function. (☞ Page 75 Latch Function)

*3 Up to 4096 X/Y points set in the GX Works3 [System Parameter] → "I/O Assignment Setting" can be used as actual input/actual output. (By specifying I/O settings other than group settings, the I/O status for management of other CPUs can be read.)

*4 The total number of devices for the number of devices/latch setting can be changed within 128k words.(☞ Page 73 Device Setting)

*5 Includes dedicated positioning devices.

*6 □ indicates the CPU No. (CPU No.1: 0, CPU No.2: 1, CPU No.3: 2, CPU No.4: 3).

*7 This is the usage range at the Motion CPU. The maximum number of CPU buffer memory access devices will differ depending on the CPU module.

*8 The total number for each unit can be changed within 24k words in the GX Works3 [System Parameter] → [Multiple CPU Setting]. However, the maximum number per CPU is 12288.

*9 □ indicates 00h to FFh (module I/O No. /10h). The accessible range differs depending on the module. Refer to the manual for the module being used.

Point

[Device writing precautions]

Do not write to the following devices from the Motion CPU. Writing will be ignored, or a malfunction will occur.

- Actual input devices, or I/O number that is not allocated to any module and is within range of the maximum I/O number for the modules being used, from inputs (X).
- Actual output devices from outputs (Y) for which other CPU management performed.
- Other CPU buffer memory access devices (U3E□\G, U3E□\HG).
- Other CPU management module access devices (U□\G).
- Devices updated at the module side from module access devices (U□\G).
- Devices other than user set devices from special relays (SM), special registers (SD).
- Monitor signals from internal relay (M), data register (D), Motion register (#) dedicated positioning devices.

Devices that can be used with each function

The following is a list of word and bit devices that can be used with each Motion CPU function.

○: Setting possible, △: Setting possible (restrictions apply), ×: Setting not possible

Item				Device type			System device compatibility (SM/SD)
				Bit device	Word device Bit designation	Word device	
Multiple CPU refresh setting	First device			△*1	×	△*2	×
Parameter	R series common parameter	CPU refresh setting	END	△*1	×	△*2	×
			I45 executing	△*1	×	△*2	×
			Main cycle/operation cycle	△*1	×	△*2	×
		CPU parameter	RUN contact	△*3	×	×	×
	Module CPU common parameter	System basic settings	Forced stop input setting	○	○	×	○
		Limit switch output setting	Bit device setting item	○	○	×	○
			Word device setting item	×	×	○	○
		High-speed input request signal setting	Bit device setting item	○	○	×	○
			Word device setting item	×	×	○	○
		Mark detection setting	Bit device setting item	○	○	×	○
			Word device setting item	×	×	○	○
		Vision system parameter	Bit device setting item	○	○	×	○
			Word device setting item	×	×	○	○
		Head module setting	CPU refresh device setting (Input: RX, RWr/ Output: RY, RWw)	○	×	○	○
			Status device	○	×	○	○
			Monitor device	×	×	○	×
			Command device	○	×	○	○
	Motion control parameter	Axis setting parameter	Home position return data	×	×	○	×
			External signal parameter	Bit device setting item	○	○	×	×
			Expansion parameter	Bit device setting item	○	○	×	×
				Word device setting item	×	×	○	×
			Speed-torque control parameter	Bit device setting item	○	○	×	×
				Word device setting item	×	×	○	×
			Optional data monitor	Storage device No.	×	×	○	×
			Pressure control data	Bit device setting item	○	○	×	×
				Word device setting item	×	×	○	×
			Override data	Word device setting item	×	×	○	×
			Vibration suppression command filter data	Bit device setting item	○	○	×	×
				Word device setting item	×	×	○	×
		Synchronous control parameter	Command generation axis parameter	Bit device setting item	○	○	×	×
				Word device setting item	×	×	○	×
			Multiple CPU advanced synchronous control setting	Status device setting	○	○	○	×
Device allocation				△*4	×	△*2	×

Item				Device type			System device compatibility (SM/SD)
				Bit device	Word device Bit designation	Word device	
Latch function				△*4	×	△*2	×
Program	Motion dedicated sequence command	Device writing to Motion CPU(D(P).DDWR/M(P).DDWR)		○	×	△*2	○
		Reading from Motion CPU device (D(P).DDRD/M(P).DDRD)		○	×	△*2	○
	Servo program(K)	Servo command	Bit device setting item	○	○	×	○
			Word device setting item	×	×	○	○
		Positioning data	Bit device setting item	○	○	×	○
			Word device setting item	×	×	○	○
	Motion SFC program	Operation control program (F/FS)/ transition program (G)	Bit device setting item	○	△*5	×	○
			Word device setting item	×	×	○	○
		WAIT ON/WAIT OFF		○	○	×	○
	Motion SFC parameter	Program parameter	Executing flag	△*1	○	×	×
Digital oscilloscope	Sampling function	Sampling target		○	○	○	○

*1 Annunciators (F) cannot be set.
*2 CPU buffer memory access devices (U3E□\G, U3E□\HG) and module access devices (U□\G) cannot be set.
*3 Only inputs (X) can be set.
*4 Inputs (X) and outputs (Y) cannot be set.
*5 Setting is not possible for commands (BMOV, FMOV, TO, RTO, RFROM, DIN, DOUT) in which bit data is used as 16 point units or 32 point units.

3.2 User Device

This section describes user devices used with the Motion CPU.

Input (X)

These are commands or data given to the Motion CPU with external devices such as buttons, switches, limit switches, and digital switches.

Output (Y)

These are program control results output to external signal lamps, digital displays, electromagnetic contactors, and solenoids, etc.

Internal relay (M)

These are devices intended for use as auxiliary relays inside the Motion CPU. When the following operations are performed, all internal relays turn OFF.

- Multiple CPU system power OFF → ON
- Multiple CPU system reset
- Latch clear

Some internal relays (M) are used as positioning signals.
Refer to the following for details.
MELSEC iQ-R Motion Controller Programming Manual (Positioning Control)

Link relay (B)

These are devices intended for use as auxiliary relays inside the Motion CPU. Link relays perform the same role as internal relays (M).

Annunciator (F)

These are devices intended for use as auxiliary relays inside the Motion CPU. Annunciators perform the same role as internal relays (M).

Data register (D)

These devices are able to store numerical data. Some data registers (D) are used for positioning control.
Refer to the following for details.
MELSEC iQ-R Motion Controller Programming Manual (Positioning Control)

Link register (W)

These devices are able to store numerical data. Link registers (W) perform the same role as data registers (D).

Motion register (#)

These devices are able to store numerical data. Some Motion registers (#) are used as monitoring devices.
Refer to the following for details.
MELSEC iQ-R Motion Controller Programming Manual (Positioning Control)

3.3 System Device

System devices are devices for the system. Allocation and capacity are fixed, and cannot be changed arbitrarily.

Special relay (SM)

These are internal relays whose specifications inside the Motion CPU are fixed, and as with standard internal relays, they cannot be used at the program. However, they can be turned ON and OFF to control the Motion CPU if required.
Refer to special relays for details on special relays. (☞ Page 295 Special Relays)

Special register (SD)

These are internal registers whose specifications inside the Motion CPU are fixed, and as with standard internal registers, they cannot be used at the program. However, data can be written to control the Motion CPU if required.
Refer to special registers for details on special registers. (☞ Page 300 Special Registers)

3.4 CPU Buffer Memory Access Device

These devices access memory used to read and write data between CPU modules in a Multiple CPU system.

Specification method

Specify with U [CPU module installation position]\[Communication area][First address in buffer memory].

U 3E□ \ □ □

- First address in buffer memory
- Communication area
  - G: CPU buffer memory
  - HG: Fixed scan communication area
- CPU module installation position
  - CPU No.1: 3E0
  - CPU No.2: 3E1
  - CPU No.3: 3E2
  - CPU No.4: 3E3

Ex.

CPU No.2, CPU buffer memory address 4095

● U3E1\G4095

CPU No.3, CPU buffer memory (fixed scan communication area) address 1024

● U3E2\HG1024

3.5 Module Access Device

These devices are used to directly access the buffer memory in intelligent function modules or I/O modules installed on the main base unit or expansion base unit from the Motion CPU.

Specification method

Specify with U [Intelligent function module or I/O module I/O No.*1]\[Buffer memory address].

*1 2 high-order digits if first I/O No. is expressed with 3 digits
For X/Y1F0: X/Y1F0 → Specification: 1F

U □ \ □
- → Buffer memory address
- → Intelligent function module or I/O module I/O number
  • 00 to FF

Ex.

Intelligent function module I/O No. 050, buffer memory address 11

● U5\G11

3.6 Constants

This section describes constants.

Decimal constants (K)

These devices are used to specify decimal data in the program. Specify with K□.

The specification range is determined based on the argument data type for the instruction using the decimal constant.

Hexadecimal constants (H)

These devices are uses to specify hexadecimal data in the program. Specify with H□.

To specify data by BCD, specify each hexadecimal digit with 0 to 9.

The specification range is determined based on the argument data type for the instruction using the hexadecimal constant.

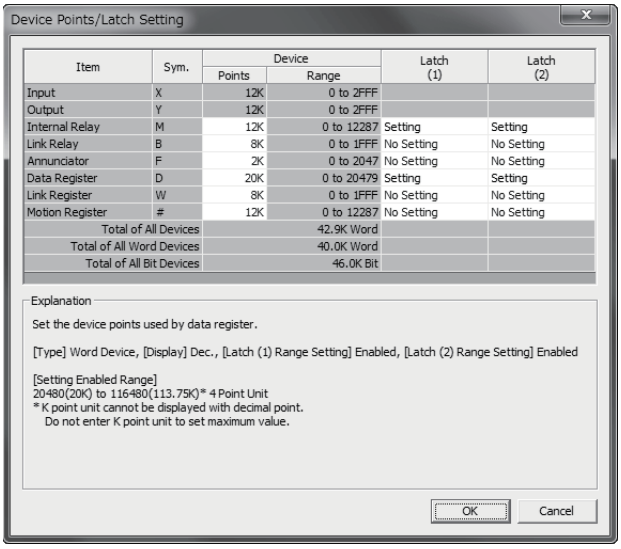
3.7 Device Setting

No. of devices setting for user devices

The number of devices used can be changed with the number of device points/latch setting.

[R Series Common Parameter] → [Motion CPU Module] → [CPU Parameter] → "Device Related Setting" → "Device Points/Latch Setting" → "Detailed Setting"

Window


Device Points/Latch Setting
Item
Sym.
Device
Points
Range
Latch (1)
Latch (2)
Input X 12K 0 to 2FFF
Output Y 12K 0 to 2FFF
Internal Relay M 12K 0 to 12287 Setting Setting
Link Relay B 8K 0 to 1FFF No Setting No Setting
Annunciator F 2K 0 to 2047 No Setting No Setting
Data Register D 20K 0 to 20479 Setting Setting
Link Register W 8K 0 to 1FFF No Setting No Setting
Motion Register # 12K 0 to 12287 No Setting No Setting
Total of All Devices 42.9K Word
Total of All Word Devices 40.0K Word
Total of All Bit Devices 46.0K Bit
Explanation
Set the device points used by data register.
[Type] Word Device, [Display] Dec., [Latch (1) Range Setting] Enabled, [Latch (2) Range Setting] Enabled
[Setting Enabled Range]
20480(20K) to 116480(113.75K)* 4 Point Unit
* K point unit cannot be displayed with decimal point.
Do not enter K point unit to set maximum value.
OK
Cancel

Precautions

Pay attention to the following if changing the number of devices.

- The number of inputs (X) and outputs (Y) cannot be changed.
- The maximum number of total user devices is 128k words.
- The range within which each device can be changed is shown below.

Device	Setting unit	Default No. of points	Min. No. of points	Maximum No. of points
Internal relay (M)	64 points	12k (12288) points	12k (12288) points	128k (131072) points
Link relay (B)	64 points	8k (8192) points	0k (0) points	128k (131072) points
Annunciator (F)	64 points	2k (2048) points	0k (0) points	128k (131072) points
Data register (D)	4 points	20k (20480) points	20k (20480) points	113.75k (116480) points*1
Link register (W)	4 points	8k (8192) points	0k (0) points	93.75k (96000) points*1
Motion register (#)	4 points	12k (12288) points	12k (12288) points	105.75k (108288) points*1

*1 If devices other than the relevant device are set as the minimum number of set devices

Point

- If the number of user devices used is changed, the change will be valid when power supply of the Multiple CPU system is turned ON, or when reset.
- If changing the number of user devices used, ensure that the Multiple CPU refresh range and latch range do not lie outside the range for the number of devices. If the relevant device range is exceeded, data may be written to another device, or an error may occur.

User device memory capacity

Set user devices so that they satisfy the following formula.

(Bit device capacity) + (word device capacity) ≤ 128k words

■Bit devices

For bit devices, 16 points are calculated as 1 word.

$$\text{(Bit device capacity)} = \frac{(X+Y+M+B+F)}{16} \text{ (words)}$$

■Word devices

For data registers (D), link registers (W), and Motion registers (#), 16 points are calculated as 16 words.

$$\text{(Word device capacity)} = \frac{(D+W+\#)}{16} \times 16 \text{ (words)}$$

Device allocation examples

An example of device point allocation is shown below.

Device name		Symbol	Number base	Device points		Limit check	
				Points	Setting range	Capacity (words)	
Bit devices	Input	X	Hexadecimal	12k (12288) points	X0 to X2FFF	÷ 16	768 words
	Output	Y	Hexadecimal	12k (12288) points	Y0 to Y2FFF	÷ 16	768 words
	Internal relay	M	Decimal.	16k (16384) points	M0 to M16383	÷ 16	1024 words
	Link relay	B	Hexadecimal	1k (1024) points	B0 to B03FF	÷ 16	64 words
	Annunciator	F	Decimal.	4k (4096) points	F0 to F4095	÷ 16	256 words
Word devices	Data register	D	Decimal.	22k (22528) points	D0 to D22527	× 1	22528 words
	Link register	W	Hexadecimal	5k (5120) points	W0 to W13FF	× 1	5120 words
	Motion register	#	Decimal.	15k (15360) points	#0 to #15359	× 1	15360 words
Device total							45888 words (131072 words or less)

3.8 Latch Function

The content of each Motion CPU device is cleared in the following cases, and is returned to the respective default value (bit devices: OFF, word devices: 0).

- Multiple CPU system power supply OFF to ON
- Multiple CPU system reset
- Power failure longer than permissible momentary power failure time

The content of each device for which the latch setting has been specified is retained in the event of a power failure even in the above cases. Consequently, when managing data when performing consecutive control, all data is retained, allowing control to be continued even if the Multiple CPU system power supply turns OFF to ON, or if a power failure longer than permissible momentary power failure time occurs.

Devices for which latch is possible

Devices for which a latch is possible are as follows.

- Internal relays (M)
- Link relays (B)
- Annunciators (F)
- Data registers (D)
- Link registers (W)
- Motion registers (#)

Operation when latches used

Operation in the program is the same regardless of whether a latch has been set.

Latch range setting

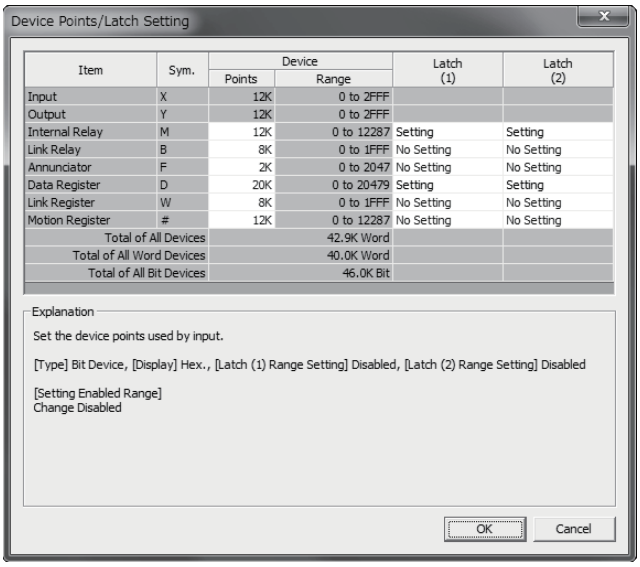
Set the latch range for each device with the device points/latch setting.

Multiple latch ranges can be set for each device type. A combined total of 32 latch ranges can be set for latch (1) and latch (2). However, the latch range must be set so that the latch (1) and latch (2) ranges do not overlap.

Latch range setting is valid when the Multiple CPU system power supply is turned ON.

[R Series Common Parameter] → [Motion CPU Module] → [CPU Parameter] → "Device Related Setting" → "Device Points/Latch Setting" → "Detailed Setting"

Window


Device Points/Latch Setting
Item
Sym.
Device
Points
Range
Latch (1)
Latch (2)
Input X 12K 0 to 2FFF
Output Y 12K 0 to 2FFF
Internal Relay M 12K 0 to 12287 Setting Setting
Link Relay B 8K 0 to 1FFF No Setting No Setting
Annunciator F 2K 0 to 2047 No Setting No Setting
Data Register D 20K 0 to 20479 Setting Setting
Link Register W 8K 0 to 1FFF No Setting No Setting
Motion Register # 12K 0 to 12287 No Setting No Setting
Total of All Devices 42.9K Word
Total of All Word Devices 40.0K Word
Total of All Bit Devices 46.0K Bit
Explanation
Set the device points used by input.
[Type] Bit Device, [Display] Hex., [Latch (1) Range Setting] Disabled, [Latch (2) Range Setting] Disabled
[Setting Enabled Range]
Change Disabled
OK
Cancel

Clearing the latch range

The latch (1) and latch (2) ranges are cleared with the following operations. (☞ Page 233 Memory Initialization)

Latch range	Clear operation
Latch (1)	• Clearing the MT Developer Motion CPU memory. • Cleaning built-in memory with Motion CPU rotary switch "C".
Latch (2)	Cleaning built-in memory with Motion CPU rotary switch "C".

Precautions

- When increasing the ranges set for latch (1) or latch (2), the latch device value when the Multiple CPU system power supply is turned ON again after parameter writing will be the value when the power supply was previously turned OFF.
- All latch ranges are cleared if the number of devices setting differs from the setting at the previous operation when turning ON the Multiple CPU system or when resetting.

3.9 Labels

A label is a variable consisting of a specified character string used in I/O data or internal processing.
Using labels in programming enables creation of programs without being aware of devices and buffer memory sizes.
For this reason, a program using labels can be reused easily even in a system having a different module configuration.

Labels registered in the Motion CPU

The labels registered in the Motion CPU are labels that provide the same data within a single project. It can be used in all programs in the project.
The settings of a label include a label name, and data type.
By opening labels, they can be referenced from GOT and other stations, and can be used for monitoring and accessing data.
Label settings are performed in MT Developer2.
Refer to the following for the setting method of labels.
Help of MT Developer2

Classes

The label class indicates which program the label is from and how a label can be used.

Class	Description
VAR_GLOBAL	A common label that can be used in programs.

Data types

The data types of a label are classified according to the bit length, processing method, and value range.
The following table lists the data types.

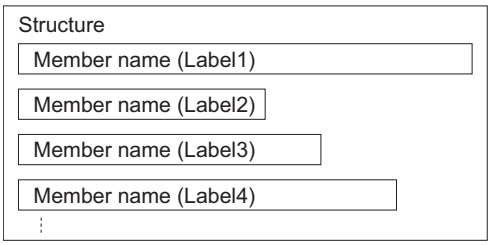
Data type	Description	Value range	Bit length
Bit	Represents the alternative status, such as ON or OFF.	0 (FALSE), 1 (TRUE)	1 bit
Word [signed]	Positive and negative integer values.	-32768 to 32767	16 bits
Double word [signed]	Positive and negative double-precision integer values.	-2147483648 to 2147483647	32 bits
Word [unsigned]/bit string [16 bits]	16-bit array.	0 to 65535	16 bits
Double word [unsigned]/bit string [32 bits]	32-bit array.	0 to 4294967295	32 bits
Double-precision real number	Numerical values of decimal places (double-precision real number values). Number of significant digits: 15 (14 digits of decimal places)	-1.79E+308 to -2.23E-308, 0.0, 2.23E-308 to 1.79E+308	64 bits

Structures

A structure is a data type containing one or more labels and can be used in all programs.
Members (labels) included in a structure can be defined even when their data types are different.

Creating structures

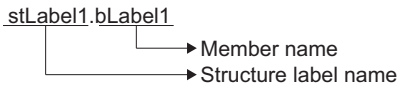
To create a structure, first define the structure, and then define members in the structure.



How to use structures

To use a structure, register a label using the defined structure as the data type.
To specify each member in a structure, add the member name after the structure label name with a period '.' as a delimiter in between.

Ex.
Specifying a member in the structure



4 AUXILIARY AND APPLIED FUNCTIONS

4.1 Limit Switch Output Function

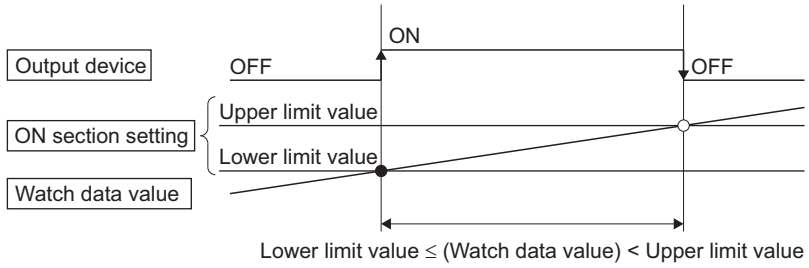
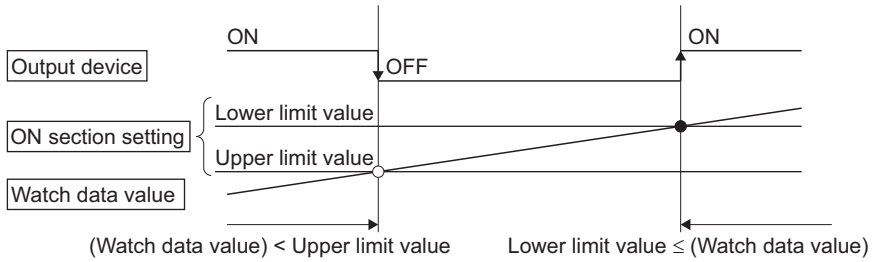
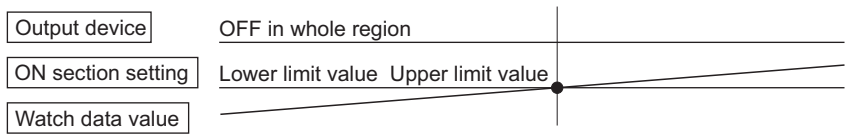
This function is used to output the ON/OFF signal corresponding to the data range of the watch data set per output device.
Motion control data or optional word data can be used as watch data.(☞ Page 81 Limit output data setting)
A maximum output device for 64 points can be set regardless of the number of axes.

Operations

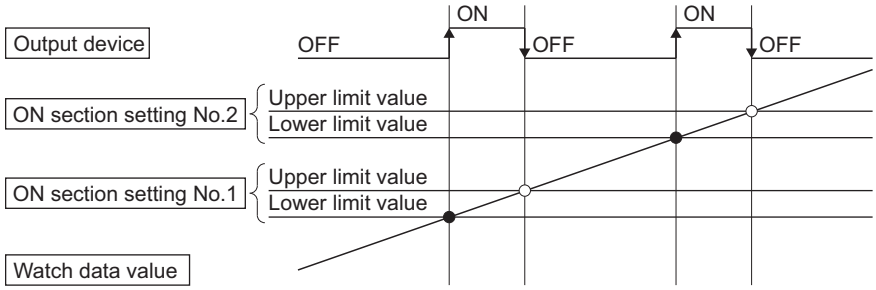
Limit switch output function

ON output to an output device is made while the watch data value is in the ON region set with lower limit value and upper limit value in the limit switch output function. Up to two ON regions can be set for each limit output setting data.

- Lower limit value, upper limit value and watch data value are handled as signed data. ON output region where an ON output is made to the output device is governed by the magnitude relationship between lower limit value and upper limit value as indicated below.

Relationship between lower limit value and upper limit value	ON output region
Lower limit value < Upper limit value	Lower limit value ≤ (watch data value) < Upper limit value 
Lower limit value > Upper limit value	Lower limit value ≤ (watch data value) (Watch data value) < Upper limit value 
Lower limit value = Upper limit value	Output OFF in whole region 

- The limit switch outputs are controlled based on each watch data during the READY complete status (SM500: ON) by the "[Rq.1120] PLC ready flag (M2000)" from OFF to ON. With the setting of "M2000 keep the output device when turns OFF" invalid, when the "PCPU READY complete flag (SM500)" turns OFF by turning the "[Rq.1120] PLC ready flag (M2000)" from ON to OFF, all points turn OFF. With the setting of "M2000 keep the output device when turns OFF" valid for output devices other than Y devices, the output devices do not turn OFF even when the "[Rq.1120] PLC ready flag (M2000)" turns from ON to OFF. The setting is valid for all the output devices. Y devices always turn OFF when the "[Rq.1120] PLC ready flag (M2000)" turns from ON to OFF. When lower limit value and upper limit value are specified with word devices, the word device contents are input to the internal area when the "[Rq.1120] PLC ready flag (M2000)" turns from OFF to ON. After that, the word device contents are input per motion operation cycle, and limit switch outputs are controlled.
- Multiple outputs (Up to 64 points) can be also set to one watch data. In each setting, the output device may be the same. If both of the two regions of the ON section setting are used or if the same output device is designated by multiple output settings (regardless of whether or not the watch data is the same), the logical add of the output results in the regions is output.



Setting the forced OFF bit

Forced OFF bit can be set to forcibly turn off the output of the output device point-by-point. When the forced OFF bit is ON, the output is OFF.

Setting the forced ON bit

Forced ON bit can be set to forcibly turn on the output of the output device point-by-point. When the forced ON bit is ON, the output is ON. Priority is given to control of this setting over ON of the "forced OFF bit" (forced output OFF).

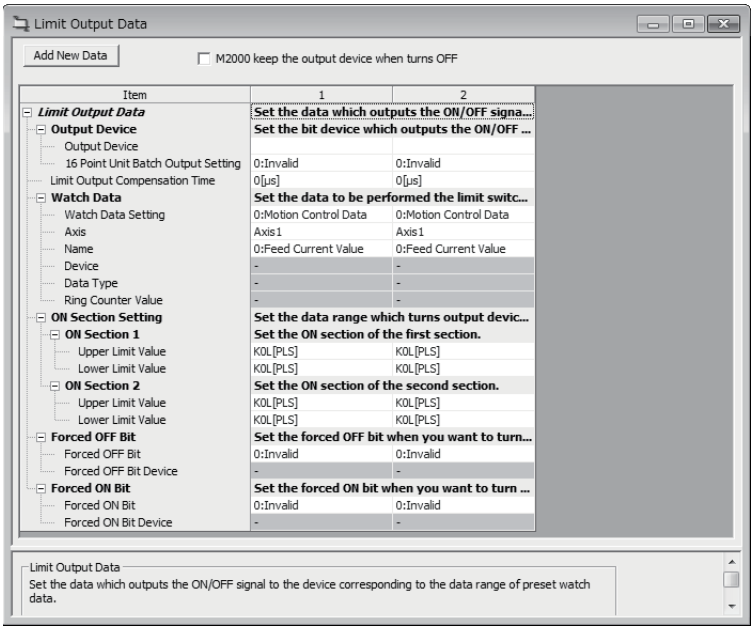
Limit output data setting

This section describes limit output data setting items.

Up to 64 points of output devices can be set. (The items in the table below are set together as one point.)

[Motion CPU Common Parameter] → [Limit Output Data]

Window



Displayed items

Item			Setting range	Fetch cycle	Refresh cycle
M2000 keep the output device when turns OFF			Invalid (default)/valid	—	—
Output device	Output device		Bit device		Operation cycle
	16 point unit batch output setting		Invalid (default)/valid		—
Limit output compensation time			-5000000 to 5000000[μs]/Word device	Operation cycle	
Watch data	Watch data setting		Motion control data/Word device data/Word device data (ring counter)		
	Axis*1		1 to 32		
	Name*1		☞ Page 83 Motion control data		
	Device*2*3		Word device		
	Data type*2*3		16-bit integer type/32-bit integer type		
	Ring counter value*3		16-bit integer type: K1 to K32767, H0001 to H7FFF 32-bit integer type: K1 to K2147483647, H00000001 to H7FFFFFFF	—	
ON section setting	ON section setting 1	Upper limit value	Word device/constant (K, H)	Operation cycle	
		Lower limit value			
	ON section setting 2	Upper limit value			
		Lower limit value			
Forced OFF bit	Forced OFF bit		Invalid (default)/valid		
	Forced OFF bit device		Bit device		
Forced ON bit	Forced ON bit		Invalid (default)/valid		
	Forced ON bit device		Bit device		

*1 When Motion control data selected

*2 When word device data selected

*3 When word device data (ring counter) selected

M2000 keep the output device when turns OFF

With this setting valid for output devices other than Y devices, the output devices do not turn OFF even when the "[Rq.1120] PLC ready flag (M2000)" turns from ON to OFF. The setting is valid for all the output devices. Y devices always turn OFF when the "[Rq.1120] PLC ready flag (M2000)" turns from ON to OFF.

Output device

- Set the bit device which outputs the ON/OFF signal toward the preset watch data.
- As the output device, bit devices are used. Refer to device list for the range of bit devices that can be set. (☞ Page 66 Device List)
- When the 16 point unit batch output setting is valid, the batch output of the sequential 16 point unit devices has less effect on the operation cycle as compared with the output of each output device point-by-point. When the 16 point unit batch output setting is valid, it is recommended to set multiple output devices as sequential 16 point unit output devices. The sequential devices to be output in a 16 point unit batch is counted as one set and up to 4 sets can be set. When the 16 point unit batch output setting is valid, among the 16 point unit devices, the devices that are not used as the output devices are always OFF.

16 point unit batch output setting	Control description
Invalid	The output device is output point-by-point.
Valid	The sequential 16-point output devices are output in a batch.

Limit output compensation time

Compensate the output timing of the output device.
Set it to compensate for output signal delays. (Set a positive value to compensate for a delay.)
In indirect setting, the timing is compensated as "-5000000" when the compensation time is set to less than -5000000, and it is compensated as "5000000" when it is set to more than 500000.

■Direct setting

Setting range
-5000000 to 5000000[μs]

■Indirect setting

Word devices are used for the limit output compensation time.
Set an even number for the device number. Refer to device list for the range of word devices that can be set. (☞ Page 66 Device List)

Watch data

This data is used to perform the limit switch output function. This data is comparison data to output the ON/OFF signal. The output device is ON/OFF-controlled according to the ON section setting.

As the watch data, motion control data, word device data or word device data (ring counter) can be used.

■Motion control data

Settable watch data is shown in the following table.

Item	Unit	Data type	Axis No. setting range		Remarks
			R32MTCPU	R16MTCPU	
Feed current value	Control unit	32-bit integer type	1 to 32	1 to 16	—
Real current value					
Servo command value	pulse				
Position feed back					
Absolute position encoder single revolution position					
Absolute position encoder multiple revolution position	—	16-bit integer type			
Deviation counter value	pulse	32-bit integer type			
Servo command speed	pulse/s				
Motor speed	0.01r/min				
Motor current value	0.1%	16-bit integer type			
Command generation axis feed current value	Control unit	32-bit integer type			
Command generation axis cumulative current value					
Command generation axis current value per cycle					
Synchronous encoder axis current value	Encoder axis unit		1 to 12		
Synchronous encoder axis current value per cycle					
Cam axis current value per cycle	Cam axis cycle unit		1 to 32	1 to 16	Valid in synchronous control
Cam axis current value per cycle (Actual)					

■Word device data/word device data (ring counter)

- Device

  Word devices are used for watch data. Refer to device list for the range of word devices that can be set. (☞ Page 66 Device List)

- Data type

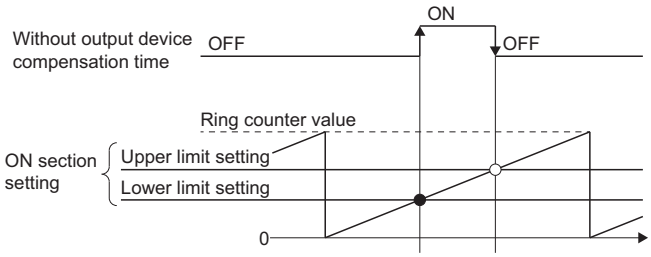
  The following data type is set as the data type to be compared.

Data type	Remarks
16-bit integer type	—
32-bit integer type	Set the device No. as an even No.

• Ring counter value

When the watch data is the word device data (ring counter), the ring counter value is set.

Data type	Remarks
16-bit integer type	H0001 to H7FFF
32-bit integer type	K1 to K2147483647, H00000001 to H7FFFFFFF



Point

For the word device data updated as ring counter, when the output timing is compensated without setting the correct ring counter value or when the output timing is compensated by setting the ring counter for the word device data that is not updated as ring counter, the output device may not be output at the correct timing.

ON section setting

- The data range which makes the output device turn ON/OFF toward the watch data. Up to two ON regions can be set for each limit output setting data.
- Word devices constants (Hn/Kn) can be used as the lower limit value and upper limit value of the data range. The data type of device/constant to be set is the same as the type of watch data. Refer to device list for the range of word devices that can be set. (☞ Page 66 Device List)

Forced OFF bit

- Set the "forced OFF bit" when forced OFF of the output device is desired during operation. The following control is exercised.

Forced OFF bit		Control description
Invalid		Output device is turned ON/OFF based on the ON section setting.
Valid	OFF	
	ON	Output device is turned OFF.

- Bit devices are used for forced OFF bits. Refer to device list for the range of bit devices that can be set. (☞ Page 66 Device List)

Forced ON bit

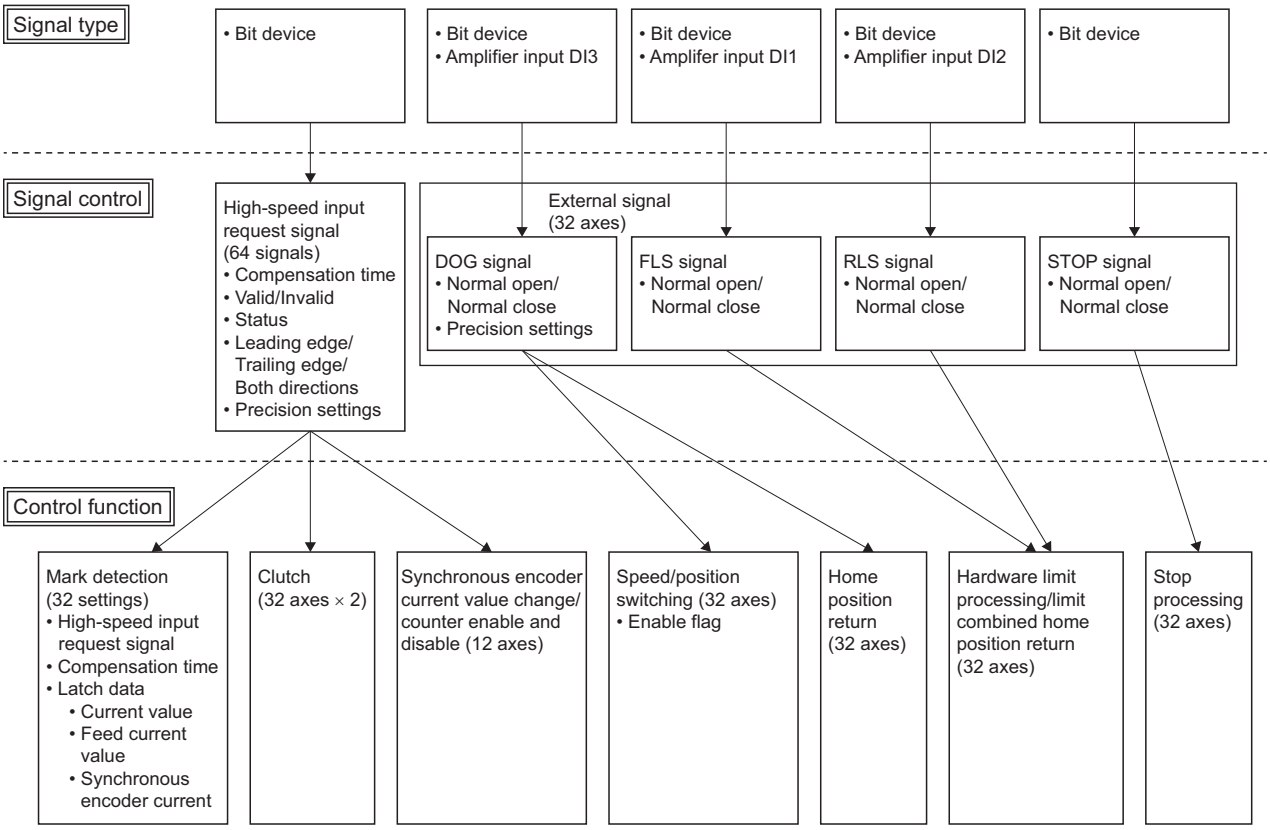
- Set the "forced ON bit" when forced ON of the output device is desired during operation. The following control is exercised.

Forced ON bit		Control description
Invalid		Output device is turned ON/OFF based on the ON section setting.
Valid	OFF	
	ON	Output device is turned ON.

- Bit devices are used for forced ON bits. Refer to device list for the range of bit devices that can be set. (☞ Page 66 Device List)

4.2 External Input Signal

External input signals are managed as "external signals" or "high-speed input request signals".
External signals are used with control functions such as home position return, speed/position switching control, hardware limits, and stop processing.
High-speed input request signals are used with control functions such as mark detection clutch control, and synchronous encoder axis current value changes.

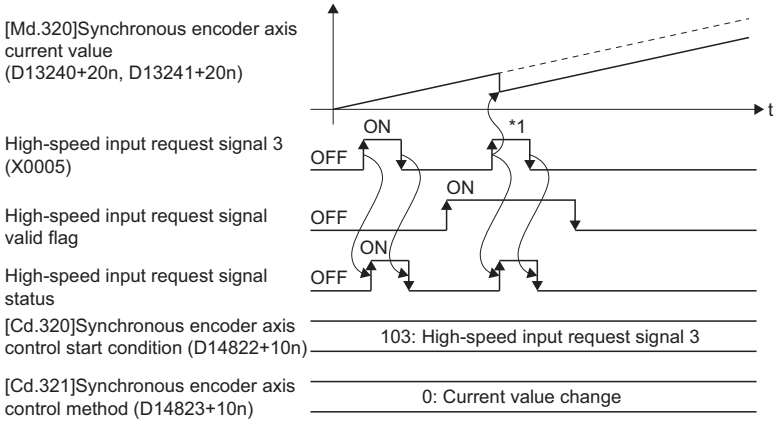


External signal

External signals (FLS signals, RLS signals, STOP signals, DOG signals) are assigned to each axis, and are used with control functions such as home position return, speed/position switching control, hardware limits, and stop processing.
External signals are set in the external signal parameters.
Refer to following for details on external signal parameters.
MELSEC iQ-R Motion Controller Programming Manual (Positioning Control)

High-speed Input Request Signal

Set the allocation of high-speed input request signals. The high-speed input request signals are used for mark detection and to control clutch ON/OFF operations, synchronous control or the counter enable/counter disable/current value change operation of the synchronous encoder axis with high accuracy. An example of current value change of the synchronous encoder axis using input module (X0005) as the high-speed input request signal is shown below.



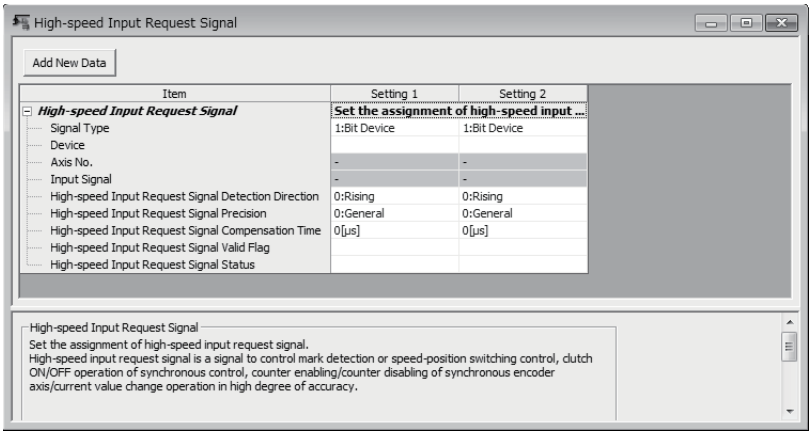
*1: Set the high-speed input request signal detection direction to "Rising"

High-speed input request signal setting

This section describes the high-speed input request signal setting items. Up to 64 signals can be registered.

[Motion CPU Common Parameter] → [High-speed Input Request Signal]

Window



Displayed items

Item	Setting range
High-speed input request signal	Bit device/Amplifier input
High-speed input request signal detection direction	Rising/Falling/Both directions
High-speed input request signal precision	General/High precision
High-speed input request signal compensation time	-5000000 to 5000000[µs]/Word device
High-speed input request signal valid flag	—[*1]/Bit device
High-speed input request signal status	—[*1]/Bit device

*1 This setting can be omitted.

■High-speed input request signal

Set the input signal for high-speed input request signal.

- Bit device

  Bit devices are used for high-speed input request signals. Refer to device list for the range of bit devices that can be set. (☞ Page 66 Device List)

- Amplifier input

  Input signals DI1 to DI3 of the servo amplifier are used for high-speed input request signals.

Input module	Axis No.		Input signal
	R32MTCPU	R16MTCPU	
Servo amplifier	1 to 32	1 to 16	DI1 to DI3

■High-speed input request signal detection direction

Set whether to perform the high-speed input request signal detection operation in the input signal rising (OFF to ON), falling (ON to OFF), or both directions (OFF to ON, ON to OFF).

Input signal detection direction	Remarks
Rising	Performs high-speed input request detection with the input signal OFF to ON.
Falling	Performs high-speed input request detection with the input signal ON to OFF.
Both directions	Performs high-speed input request detection with the input signal OFF to ON or ON to OFF.

■High-speed input request signal precision

Set the precision of high-speed input request signals.

High-speed input request signal precision	Signal type	Setting required on the module side	Detection precision[μs]
General	Bit device	None	222*1
	Amplifier input (DI1 to DI3)	None	• Operation cycle 1.777[ms] or less: Operation cycle • Operation cycle 3.555[ms] or more: 3555
High-precision	Bit device	• Enable the inter-module synchronization function.*2 • Set the input response time.	*3

*1 When using an actual device with the inter-module synchronization setting, the inter-module synchronization cycle is used.

*2 When not set, a moderate error (error code: 30D3H) occurs.

*3 Detection precision of the high precision setting of the bit device.

Input response time [ms]	Detection precision	
	Theoretical value [μs]	Measured value [μs]
0.10	4.9	7
0.20	9.9	12
0.40	19.8	22
0.60	25.0	27
1.00	39.5	41
5.00	158	160
10.00	316	318
20.00	630	632
70.00	2500	2502

- General

  The detection precision is based on the fixed-cycle processing of the Motion CPU. General detection precision is used even when the input module setting is "Enable synchronization between modules".

- High precision

  When the input module setting is "inter-module synchronization valid", by setting the high-speed input request signal accuracy to "High precision", high-speed input request signals can be controlled with high precision. If this signal is specified for a signal that is not compatible with high-precision input, a moderate error (error code: 30D3H) occurs.

■High-speed input request signal compensation time

Compensate the input timing of the high-speed input request signal. Set it to compensate for sensor input delays, etc. Set a positive value to compensate for a delay, and set a negative value to compensate for an advance. However, high-speed input request status outputs the status of the signal with no relation to the set value.

In indirect setting, the timing is compensated as "-5000000" when the compensation time is set to less than -5000000, and it is compensated as "5000000" when it is set to more than 500000.

If "Estimate calculation" is set to "Invalid" in the mark detection settings, the input timing for high-speed input request signals is not compensated.

- Direct setting

Setting range
-5000000 to 5000000[μs]

- Indirect setting

  Word devices are used for the high-speed input request signal compensation time. Setting values are read each operation cycle. Refer to device list for the range of word devices that can be set. (☞ Page 66 Device List)

■High-speed input request signal valid flag

The high-speed input request signal is valid only when the flag is ON. The high-speed input request signal is invalid when the flag is OFF. This setting can be omitted. When the setting is omitted, the high-speed input request signal is valid at all times. Bit devices are used for high-speed input request signal valid flags. ON/OFF commands are read when high-speed input request signals are detected. Refer to device list for the range of bit devices that can be set. (☞ Page 66 Device List)

■High-speed input request signal status

The ON/OFF status of high-speed input request signal can be monitored. ON/OFF status can be monitored regardless of the status of the high-speed input request signal valid flag. This setting can be omitted. Bit devices are used for high-speed input request signal status. The ON/OFF status is output each operation cycle. Refer to device list for the range of bit devices that can be set. (☞ Page 66 Device List)

Point

When signals are input in situations such as the following when the detection of high-speed input request signals is unnecessary, turn the high-speed input request signal enable flag OFF, and when detection becomes necessary, turn it ON.

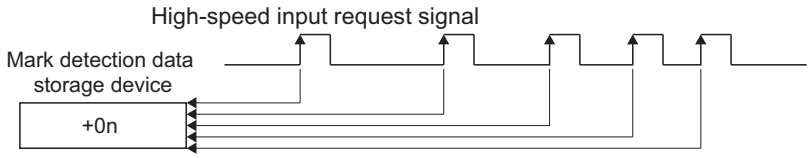
- When "[St.380] Synchronous control (M10880+n)" is OFF
- When "[Rq.320] Synchronous encoder axis control request (M11601+4n)" is OFF.
- When mark detection is not used.

4.3 Mark Detection Function

Any motion control data and all device data can be latched at the input timing of the high-speed input request signal. Also, data within a specific range can be latched by specifying the data detection range.
The following three modes are available for execution of mark detection.

Continuous Detection mode

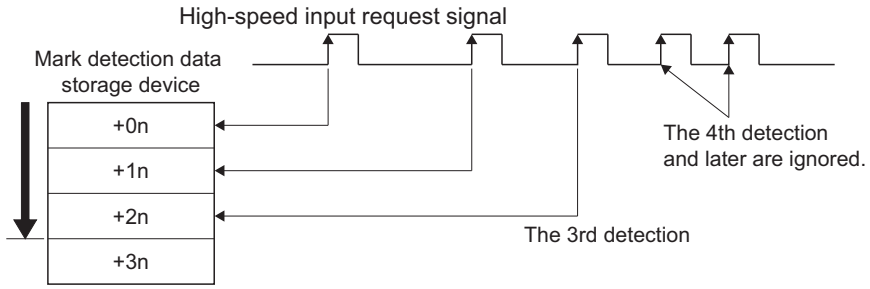
The latched data is always stored at mark detection. Operation is the same as the high-speed reading function.



Specified Number of Detection mode

The latched data from a specified number of detections is stored.

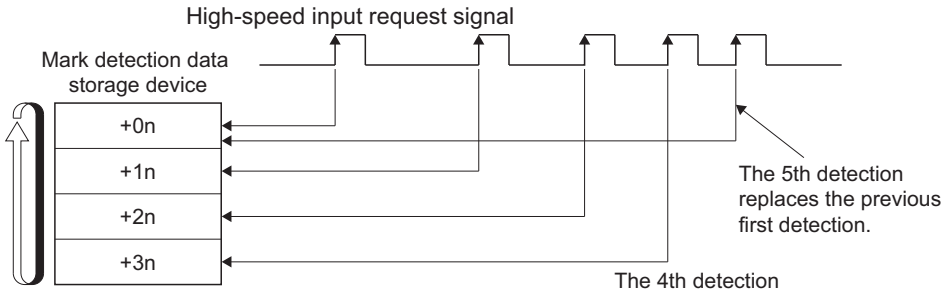
Ex.
Number of detections: 3



Ring Buffer mode

The latched data is stored in a ring buffer for a specified number of detections. The latched data is always stored at mark detection.

Ex.
Number of detections: 4



"n" in above figure is different depending on the data type storage device.

- 16-bit integer type: 1
- 32-bit integer type: 2
- 64-bit floating-point type: 4

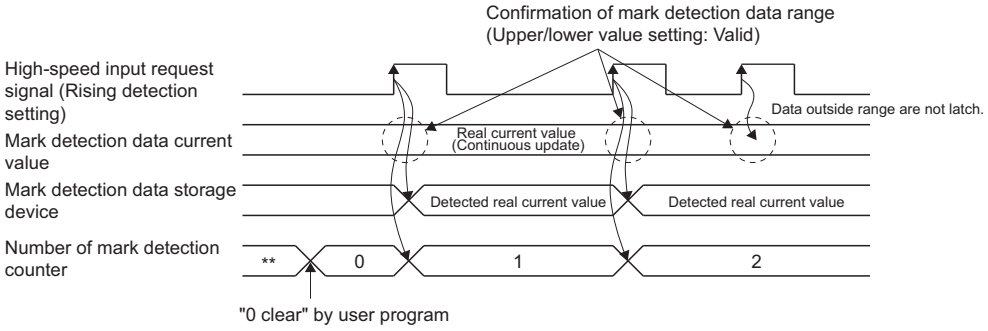
Operations

Operations done at mark detection are shown below.

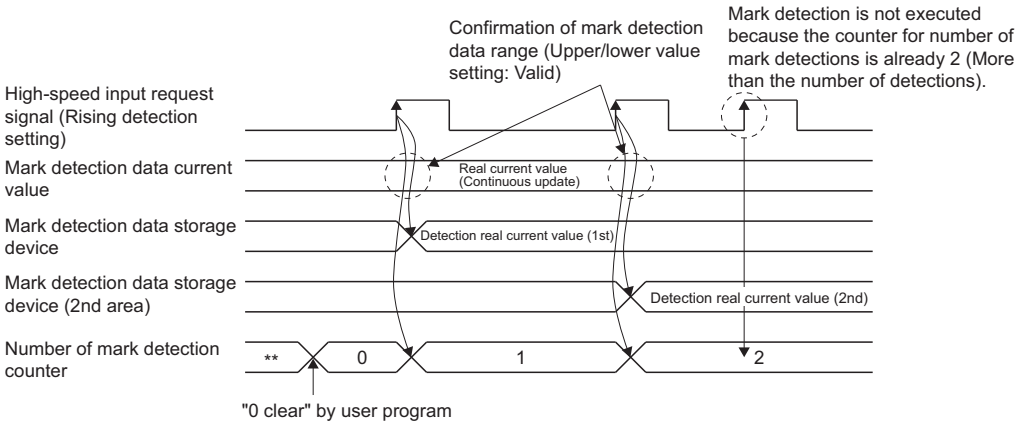
- Calculations for the mark detection data are estimated at leading edge/trailing edge/both directions of the high-speed input request signal. However, when the Specified Number of Detection mode is set, the current mark detection is checked against the counter value for number of mark detections and then it is determined whether or not to latch the current detection data.
- When a mark detection data range is set, it is first confirmed whether the mark detection data is within the range or not. Data outside the range are not detected.
- The mark detection data is stored in the first device of the mark detection data storage area according to the mark detection mode, and then the number of mark detections counter is updated.

Operation examples for each mode are shown below.

Continuous Detection mode



Specified Number of Detection mode (Number of detections: 2)

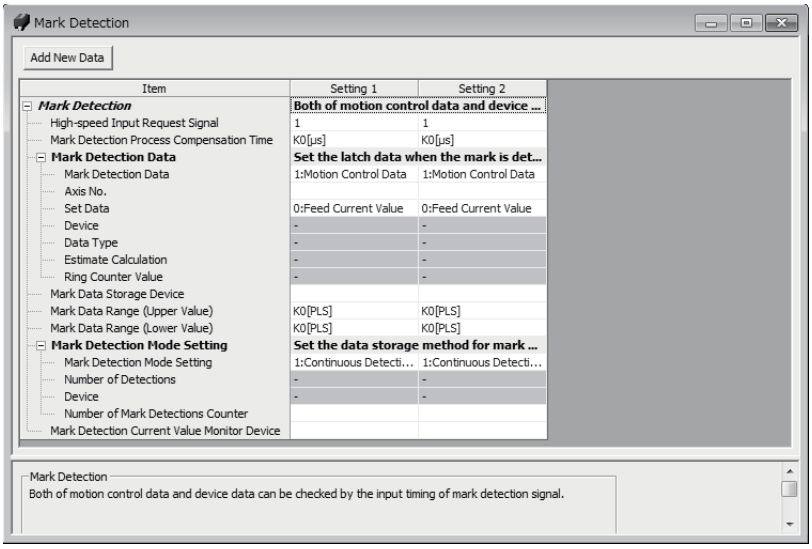

Confirmation of mark detection data range (Upper/lower value setting: Valid)
Mark detection is not executed because the counter for number of mark detections is already 2 (More than the number of detections).
High-speed input request signal (Rising detection setting)
Mark detection data current value
Mark detection data storage device
Mark detection data storage device (2nd area)
Number of mark detection counter
Real current value
(Continuous update)
Detection real current value (1st)
Detection real current value (2nd)
**
0
1
2
"0 clear" by user program

Mark detection setting

This section describes the mark detection setting items. Up to 32 mark detections setting can be registered.

[Motion CPU Common Parameter] → [Mark Detection]

Window



Displayed items

Item		Setting range
High-speed input request signal		1 to 64
Mark detection process compensation time*1		-5000000 to 5000000[µs]/Word device
Mark detection data	Mark detection data	Motion control data/Word device data
	Axis No.*2	1 to 32
	Set data*2	☞ Page 92 Motion control data
	Device*3	Word device
	Data type*3	16-bit integer type/32-bit integer type/64-bit floating-point type
	Estimate calculation*3	Valid (Normal data)/Valid (Ring counter)/Invalid
	Ring counter value*3	16-bit integer type: K1 to K32767, H001 to H7FFF 32-bit integer type: K1 to K2147483647, H00000001 to H7FFFFFFF 64-bit floating-point type: K2.23E-308 to K1.79E+308
Mark detection data storage device		Word device
Mark detection data range	Upper value	Direct designation (K, H)/Word device 16-bit integer type: K-32768 to K32767, H0000 to HFFFF 32-bit integer type: K-2147483648 to K2147483647, H00000000 to HFFFFFFFF 64-bit floating-point type: K-1.79E+308 to K-2.23E-308, K0, K2.23E-308 to K1.79E+308
	Lower value	
Mark detection mode setting	Mark detection mode setting	Continuous detection mode/Specified No. of detection mode/Ring buffer mode/Word device
	Number of detections	1 to 8192 (Specified number of detection mode/Ring buffer mode)
	Device	Word device
	Number of mark detections counter	—*4(Continuous detection mode)/Word device
Mark detection current value monitor device		—*4/Word device

*1 The mark detection signal compensation time cannot be set if "Invalid" is selected in the estimate calculation. (0[µs] is set.)
*2 When Motion control data selected
*3 When word device data selected
*4 This setting can be omitted.

High-speed Input Request Signal

Set the high-speed input request signal used for mark detection. Use the high-speed input request signal settings to specify the input signal detection direction and compensation time. Mark detection accuracy is determined by the high-speed input request signal accuracy setting.

Setting range
1 to 64

Mark detection process compensation time

The mark detection process delay time can be compensated. Set this time if wishing to compensate delays and so on inherent to mark detection process separately from the high-speed input request signal compensation time. (If compensating the delay, set a positive value.) However, when "Invalid" is selected for estimation calculation, the mark detection process compensation time cannot be set. (The time will be 0 [μs].)

In indirect setting, the timing is compensated as "-5000000" when the compensation time is set to less than -5000000, and it is compensated as "5000000" when it is set to more than 500000.

■Direct setting

Setting range
-5000000 to 5000000[μs]

■Indirect setting

Word devices are used for the mark detection process compensation time. Set an even number for the device number. Refer to device list for the range of word devices that can be set. (☞ Page 66 Device List)

Mark detection data

Set the data to latch at mark detection.

■Motion control data

Settable Motion control data is shown in the table below.

Setting Data	Unit	Data type	Axis No. setting range	
			R32MTCPU	R16MTCPU
Feed current value	10^{-1}[μm], 10^{-5}[inch], 10^{-5}[degree], [pulse]	32-bit integer type	1 to 32	1 to 16
Real current value				
Servo command value	[pulse]			
Position feed back				
Absolute position encoder single revolution position				
Absolute position encoder multiple revolution position	—	16-bit integer type		
Deviation counter value	[pulse]	32-bit integer type		
Servo command speed	[pulse/s]			
Motor speed	0.01[r/min]			
Motor current	0.1[%]	16-bit integer type		
Command generation axis feed current value	Control unit	32-bit integer type		
Command generation axis cumulative current value				
Command generation axis current value per cycle				
Synchronous encoder axis current value	Encoder axis unit		1 to 12	
Synchronous encoder axis current value per cycle				
Cam axis current value per cycle	Cam axis cycle unit		1 to 32	1 to 16
Cam axis current value per cycle (Actual)*1				

*1 Current value per cycle takes into consideration the delay of the servo amplifier.

Since the system-specific delay exists in the current value data of the synchronous encoder axis, there may be a difference between the actual current value and the current value of mark detection. When the "synchronous encoder current value", "synchronous encoder axis current value" or "synchronous encoder axis current value per cycle" is used in the mark detection data, the mark detection process compensation time shown below can be set to compensate the delay. However, when the "phase compensation advance time" is set in the synchronous control parameter to compensate the delay of the synchronous encoder, setting of the mark detection process compensation time is not necessary.

Synchronous encoder type	Mark detection process compensation time[μs]
Incremental synchronous encoder	-614
Q171ENC-W8 (Via servo amplifier)	-968

■Word device data

- Device

  Word devices are set for mark detection data. Refer to device list for the range of word devices that can be set. (☞ Page 66 Device List)

- Data type

  Set the data type at word device data setting.

Data type	Remarks
16-bit integer type	—
32-bit integer type	Set the device No. as an even No.
64-bit floating-point type	

- Estimate calculation

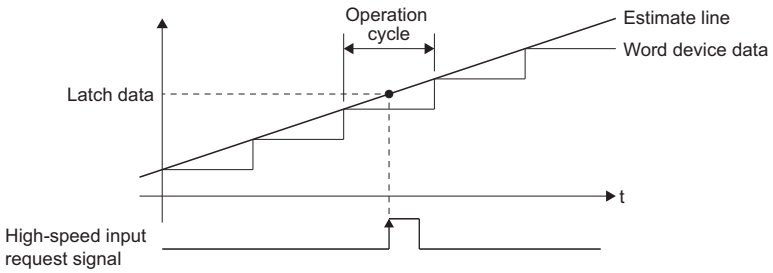
  Set the estimate calculation to "Valid/Invalid" at the word device data setting.

Estimate calculation		Ring counter value	
Valid	Normal data	—	
	Ring counter	16-bit integer type	K1 to K32767, H0001 to H7FFF
		32-bit integer type	K1 to K2147483647, H00000001 to H7FFFFFFF
		64-bit floating-point type	K2.23E-308 to K1.79E+308
Invalid		—	

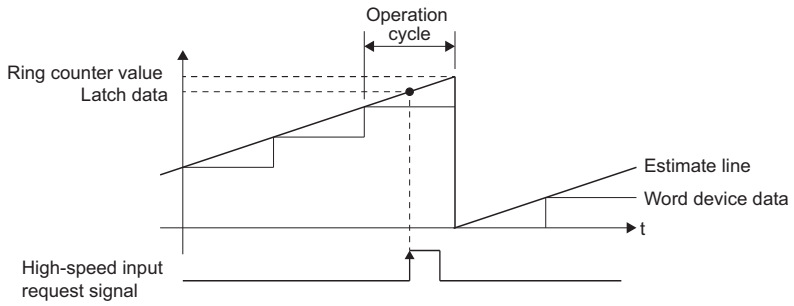
(1) Estimate calculation: Valid

Calculation for word device data in the operation cycle is estimated. The latch data is the value estimated at the timing in which the high-speed input request signal is input. The value is calculated as shown in the figure below whether the word device data is normal data or a ring counter. Set the ring counter value for the ring counter.

• Valid (Normal data)



• Valid (Ring counter)

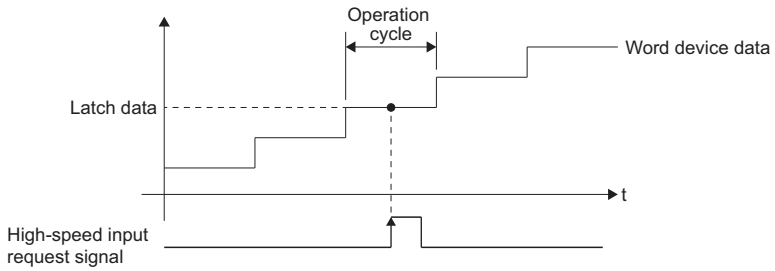


Point

If "Valid (Normal data)" is selected for word device data updated as a ring counter, the latch data may not be estimated correctly.

(2) Estimate calculation: Invalid

Calculation for word device data in operation cycle is not estimated. The latch data is the word device data at the timing in which the high-speed input request signal is input. The detection accuracy is the operation cycle regardless of the high-speed input request signal type.



Mark detection data storage device

Set the mark detection data storage device (first device to use in the "Specified Number of Detections mode" or "Ring Buffer mode"). When using the "Specified Number of Detections mode" or "Ring Buffer mode", reserve the device area to accommodate the number of detections. Word devices are set for mark detection data storage devices. Set an even number at the start of the device for 32-bit integer type/64-bit floating-point type devices. If storing 64-bit floating-point type data in specified number of detection mode or ring buffer mode, mark detection data cannot be stored when the device No. for which mark detection data is stored is the end device No. -1. Refer to device list for the range of word devices that can be set. (☞ Page 66 Device List)

Ex.

In the below case, mark detection data is stored in W1FFA: F for the first mark detection, however, data is not stored for subsequent mark detections.

Data type: 64-bit floating-point type data

Mark detection data storage device: W1FFA

Mark detection mode: Specified Number of Detection mode or Ring Buffer mode

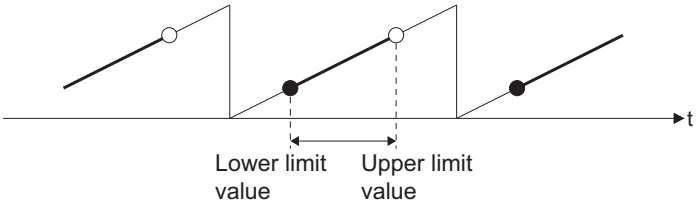
Number of mark detections set: 2 or more

Mark detection data range

When the data at mark detection is within the range, they are stored in the mark detection data storage device and the number of mark detections counter is incremented by 1. When outside of range, mark detection is not processed.

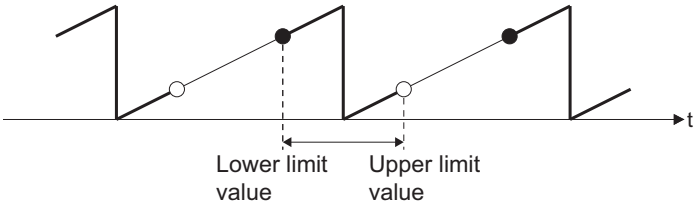
- Upper limit value > Lower limit value

  The mark detection is executed when the mark detection data is "greater or equal to the lower limit value and less than or equal to the upper limit value".



- Upper limit value < Lower limit value

  The mark detection is executed when the mark detection data is "greater or equal to the lower limit value or less than or equal to the upper limit value".



- Upper limit value = Lower limit value

  The mark detection range is not checked. The mark detection is always executed.

■Direct setting

Data type	Setting range
16-bit integer type	K-32768 to K32767, H0000 to HFFFF
32-bit integer type	K-2147483648 to K2147483647, H00000000 to HFFFFFFFF
64-bit floating-point type	K-1.79E+308 to K-2.23E-308, K0, K2.23E-308 to K1.79E+308

■Indirect setting

Word devices are set for the mark detection data range. Set an even number at the start of the device for 32-bit integer type/ 64-bit floating-point type devices. Setting values are read each operation cycle. Refer to device list for the range of word devices that can be set. (☞ Page 66 Device List)

Mark detection mode setting

Set the data storage method of mark detection.

■Direct setting

Mode	Number of detections	Operation for mark detection	Mark detection data storage method
Continuous detection mode	—	Always	The data is updated in the mark detection data storage device.
Specified number of detection mode	1 to 8192	Number of detections (If the number of mark detections counter is the number of detections or more, the mark detection is not executed.)	The data is stored in the following device area. "Mark detection data storage device + Number of mark detections counter × Mark detection data size"
Ring buffer mode	1 to 8192	Always (The mark detection data storage device is used as a ring buffer for the number of detections.)	

■Indirect setting

Word devices are set for the mark detection mode setting. Refer to device list for the range of word devices that can be set. (☞ Page 66 Device List)

- Used as a 1 word device.
- The mark detection mode is specified with the following setting values.

Setting value	Mode
0	Continuous detection mode
1 to 8192	Specified number of detection mode (Set the number of detections)
-8192 to -1	Ring Buffer mode (Set a negative value for the buffer count.)
Other than the above	Mark detection invalid

- Setting values are read each operation cycle.

Number of mark detections counter

The counter value is incremented by 1 at mark detection. Preset the initial value (0, etc.) in the user program to execute the mark detection in "Specified Number of Detections mode" or "Ring Buffer mode".Word devices are set for the mark detection times counter. Refer to device list for the range of word devices that can be set. (☞ Page 66 Device List)

- Used as a 1 word device.
- The counter is updated as follows after mark detection data storage.

Mode	Storage value
Continuous detection mode	0 to 65535 1 is added to the counter value. The counter returns to 0 if 65535 is exceeded.
Specified number of detection mode	0 to (specified number of detections) 1 is added to the counter value.
Ring buffer mode	0 to (buffer count -1) 1 is added to the counter value. The counter returns to 0 if the counter value reaches or exceeds the buffer count.

This setting can be omitted when the continuous detection mode is selected.

Mark detection current value monitor device

The current value of mark detection data can be monitored. Word devices are set for mark detection current value monitor devices. Set an even number at the start of the device for 32-bit integer type/64-bit floating-point type devices. Monitor values are updated each operation cycle. Refer to device list for the range of word devices that can be set. (☞ Page 66 Device List)
This setting can be omitted.

4.4 Servo ON/OFF

Servo ON/OFF

This function executes servo ON/OFF of the servo amplifiers connected to the Motion CPU. By establishing the servo ON status with the servo ON command, servo motor operation is enabled. The following two signals can be used to execute servo ON/OFF.

- [Rq.1123] All axes servo ON command (M2042) (Common on all axes)
- [Rq.1155] Servo OFF command (M3215+20n) (For each axis)

A list of the "[Rq.1123] All axes servo ON command (M2042)" and "[Rq.1155] Servo OFF command (M3215+20n)" is given below.

○: Servo ON (Servo operation enabled), ×: Servo OFF (Servo operation disabled)

		[Rq.1155] Servo OFF command (M3215+20n)			
		OFF		ON	
		Operation enabled/disabled	Command to servo amplifier	Operation enabled/disabled	Command to servo amplifier
[Rq.1123] All axes servo ON command (M2042)	OFF	×	Servo ON command: OFF Ready ON command: OFF	×	Servo ON command: OFF Ready ON command: OFF
	ON	○	Servo ON command: ON Ready ON command: ON	×	Servo ON command: OFF Ready ON command: ON

Point

- Refer the following for details of servo ON command OFF and ready ON command OFF from Motion CPU.
  Servo amplifier Instruction Manual
- When the delay time of "Electromagnetic brake sequence output (PC02)" is used, execute the servo ON to OFF by "[Rq.1155] Servo OFF command (M3215+20n)".
- If the servomotor is rotated by external force during the servo OFF status, follow up processing is performed. (☞ Page 98 Follow up function)
- Change between servo ON or OFF status while operation is stopped (position control mode). The servo OFF command of during operation (during start accept flag ON) will be ignored.
- When "[Rq.1123] All axes servo ON command (M2042)" is turned OFF → ON, the servo does not turn ON for axes for which the "[Rq.1155] Servo OFF command (M3215+20n)" is ON.
- When the servo OFF is given to all axes, "[Rq.1123] All axes servo ON command (M2042)" is applied even if all axis servo ON command is turned ON to OFF with "[Rq.1155] Servo OFF command (M3215+20n)".
- Even if the Motion CPU status is STOP, ON/OFF control for "[Rq.1123] All axes servo ON command (M2042)" is possible.
- "[Rq.1123] All axes servo ON command (M2042)" is forcibly turned OFF when the forced stop input bit device is turned ON → OFF (set at [Motion CPU Common Parameter] → [Basic Setting] → "Forced stop input setting".) or when a stop error (major error, moderate error) occurs.

Monitor signals

The servo ON/OFF and ready ON/OFF status can be monitored with the following signals.

■Servo ON/OFF

- [St.1075] Servo ready (M2415+20n)
- [Md.108] Servo status 1 (#8010+20n) (b1: Servo ON)

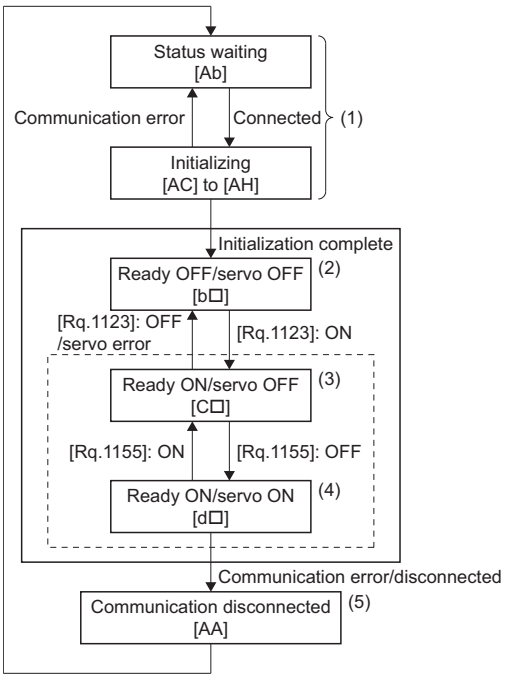
■Ready ON/OFF

- [Md.108] Servo status 1 (#8010+20n) (b0: Ready ON)

Monitor devices and the servo amplifier status

The relationship between related command devices, monitor devices and the servo amplifier status is shown below. Refer to the following for details on servo amplifier LED display and each status.

Servo amplifier Instruction Manual



*: The value in the parentheses [ ] indicates the servo amplifier LED display.

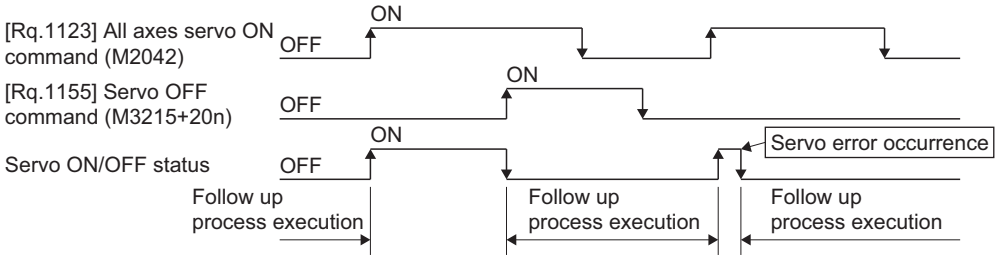
	[St.1075] Servo ready (M2415+20n)	[Md.108] Servo status1 (#8010+20n)	
		b1: Servo ON	b0: Ready ON
(1)	OFF	OFF	OFF
(2)	OFF	OFF	OFF
(3)	OFF	OFF	ON
(4)	ON	ON	ON
(5)	OFF	OFF	OFF

Follow up function

The follow up function monitors the number of motor rotations (actual present value) with the servo OFF and reflects the value in the present feed value. If the servomotor rotates during the servo OFF, the servomotor will not just rotate for the amount of droop pulses at switching the servo ON next time, so that the positioning can be performed from the stop position.

Execution of follow up

Follow up function is executed continually in the operation cycle during the servo OFF status (including servo OFF by servo error).



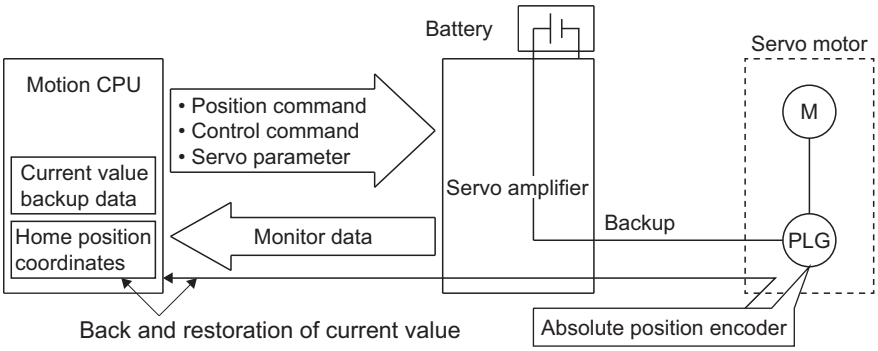
Point

The follow-up function performs the process "servo OFF" and SSCNETⅢ(/H) communication regardless of the presence of the absolute position system.

4.5 Absolute Position System

Absolute position system

The positioning control for absolute position system can be performed using the absolute-position-compatible servomotors and servo amplifiers. If the machine position is set at the system starting, home position return is not necessary because the absolute position is detected at the power on. Absolute data (current value backup data, home position data) used with absolute system control is stored in the Motion CPU internal backup memory. The absolute position system configuration is as follows.



Absolute position system start

Set the "Absolute position detection system (PA03)" in the servo parameters to "1" for axes used with the absolute position system. To establish the machine position, perform home position return with the servo program servo command (ZERO), or with test mode. (☞ Page 208 Test Mode)

Establishing the absolute position

In the absolute positioning system, the absolute position may be lost in the following cases: Set the absolute position with a home position return.

- The battery unit of the servo amplifier is removed or replaced.
- The battery error of the servo amplifier occurs. (It is detected at the servo amplifier power on).
- The machine system is disturbed by a shock.
- The cable between servo amplifier and encoder is removed, or the servo amplifier or encoder is replaced.
- If there is an abnormality with the counter of the absolute position encoder.

Monitoring the absolute position data

Absolute position data can be monitored with the MT Developer2 current value history monitor. (☞ Page 213 Current value history monitor)

Erasing of absolute position data

If a minor error (error code: 197EH) occurs because of a communication error between the servo amplifier and encoder, depending on the servo amplifier software version, "[St.1069] Home position return request (M2409+20n)" may turn ON, and absolute position data is erased.

—: There is no restriction by the version.

Servo amplifier		Operation of "[St.1069] Home position return request (M2409+20n)" when error occurs
Model name	Software version	
MR-J3-☐B	C3 or later	"[St.1069] Home position return request (M2409+20n: OFF)" does not turn ON.
MR-J3-☐B-RJ006		
MR-J3-☐B Safety		
MR-J3-☐B-RJ004	C5 or later	
MR-J3-☐B-RJ080W		
MR-J3W-☐B	B1 or later	
MR-J4-☐B	—	
MR-J4-☐B-RJ		
MR-J4-☐B-LL		
MR-J4W-☐B		
Others		"[St.1069] Home position return request (M2409+20n: ON)" turns ON. (absolute position data is lost)

Clearing absolute position data

Absolute position data stored in the Motion CPU module is erased when the built-in memory (for all axes) is cleared with the rotary switch. Always perform home position return after clearing absolute position data. Furthermore, take a data backup if necessary. Please note that absolute position data will not be lost when installing the operating system software.

⚠ CAUTION

- After removing or replacing the battery unit of the servo amplifier, check that the absolute position is established.
- After a servo amplifier battery error occurs, eliminate the cause of the error and ensure operation is safe before setting the absolute position.
- After the mechanical system is disturbed by a shock, make the necessary checks and repairs, and ensure operation is safe before setting the absolute position.

Point

- The address setting range of absolute position system is -2147483648 to 2147483647. It is not possible to restore position commands that exceed this limit, or current values after a power interruption. Correspond by the [degree] setting for an infinite feed operation.
- Even when the current value address is changed by a current value change instruction, the restored data for the current value after a power interruption is the value based on the status prior to execution of the current value change instruction.
- When home position return has not been completed (home position return request is ON), restoration of the current value after a power interruption is not possible.

Synchronous control absolute position system

The status (current value, reference position, etc.) of each module when performing advanced synchronous control is stored in the Motion CPU internal backup memory. (A backup is always taken regardless of the servo amplifier used, or the valid/invalid status of the servo motor absolute position system.) Resuming synchronous control is easy using an absolute position compatible servo motor and servo amplifier. Refer to the following for details on how to resume synchronous control.

MELSEC iQ-R Motion Controller Programming Manual (Advanced Synchronous Control)

Synchronous control backup data stored in the Motion CPU is erased (for all axes) when the built-in memory is cleared with the rotary switch. Set the synchronous positional relationship for each axis if necessary.

Saving and recovering backup data

Absolute position data stored inside the Motion CPU and synchronous control backup data can be saved or recovered with the MT Developer2 backup function. By saving/recovering not only programs and parameters, but also absolute position data and synchronous control backup data when replacing the Motion CPU module, the time take to restart can be shortened.

4.6 Clock Function

The CPU No.1 PLC CPU clock data is the standard clock information added to event history and all kinds of monitor information. The following is an overview of the clock function.

Clock data settings

Set the CPU No.1 clock data. Refer to the following for details on the CPU No.1 clock data setting method.

MELSEC iQ-R CPU Module User's Manual (Application)

The Motion CPU runs automatically based on the CPU No.1 clock data.

Clock data synchronization timing and precision

When power supply in turned ON, the clock is always synchronized with the clock data of CPU No. 1.(1ms precision)

However, for information on errors that occurred when transmission with CPU No. 1 is not established such as during initial processing, the correct clock data may not be applied.

Clock data information

The clock data transmitted by the CPU No.1 is in year (1980 to 2079), month, day of the month, day of the week, hour, minute, and second (1/1000th units).

Clock data reading

If using the clock data with the program, clock data can be read with the following special relay and special registers.

■Special relay

- Clock data read request (SM213)

Refer to special relays for details on special relays.(☞ Page 295 Special Relays)

■Special register

- Clock data (SD210) (Year)
- Clock data (SD211) (Month)
- Clock data (SD212) (Day)
- Clock data (SD213) (Hour)
- Clock data (SD214) (Minute)
- Clock data (SD215) (Second)
- Clock data (SD216) (Day of week)

Refer to special registers for details on special registers. (☞ Page 300 Special Registers)

4.7 File Transfer Function

The file transfer function is capable of reading and writing the following files with a "File transmission request (SD820)".
○: Possible, ×: Not possible

File	Reading from file	Writing to file
Servo parameters	○	○
Cam file	○	×

Point

By performing file transfer to the write target file, the existing target file is overwritten. Transfer the necessary data after first performing a backup with MT Developer2.

Device list

With the file transfer function, all requests are set in "File transmission request (SD820)", and the processing status for each request is stored in "File transfer status (SD554)".

■File transfer status devices

Device No.	Content details	Set side
SD554	The status of data transfer between the file and built-in memory is stored.	System (main processing)

Monitor value	Status	Details
0	Awaiting request acceptance	File transfer requests can be accepted.
-1	Awaiting execution	The system is waiting for a file transfer request.
-2	Executing	File transfer is being executed.
-1□□	Error completion	An error occurred and file transfer was not completed. □□ represents the following. • When servo parameters set: axis No. at which error occurred • When cam file set: fixed at 00

■File transfer request (command) devices

<table>
<tr><th>Device No.</th><th>Content details</th><th>Set side</th></tr>
<tr><td>SD820</td><td>Data between the file and built-in memory is synchronized, and a file transfer request is made. The type of data to be synchronized is set in hexadecimal notation.
<table>
<tr><th>Setting value</th><th>Command</th><th>Details</th></tr>
<tr><td>0000h</td><td>No request</td><td>This value is set when there is no request.</td></tr>
<tr><td>1000h to 9020h</td><td>Servo parameter reading/writing Command</td><td>Specifies the servo parameter target axis No. and target file to be read/written for file transfer.
H □□□□
Target axis No.(1 to 32)
00 to 20
*: “00” applies to all axes
Read/write target file
• 10: Built-in memory to file (Standard ROM)
• 20: Built-in memory to file (SD memory card)
• 80: File (Standard ROM) to built-in memory
• 90: File (SD memory card) to built-in memory</td></tr>
<tr><td>A000h to B400h</td><td>Cam file reading/writing Command</td><td>Specifies the cam file target cam No. and target file to be read/written for file transfer.
H □□□□
Target cam No.(1 to 1024)
000 to 400
*: “000” applies to all cam files
Read/write target file
• A: File (Standard ROM) to built-in memory
• B: File (SD memory card) to built-in memory</td></tr>
<tr><td>FFFEh</td><td>Execution Command</td><td>By specifying a setting value when "File transfer status (SD554)" is waiting to be executed (-1) after setting each command value, processing is executed.</td></tr>
</table>
</td><td>User
(During STOP/during RUN)</td></tr>
</table>

Point

- The moment that the servo parameter read/write command (1000h to 9020h) and cam file read/write command (A000h to B400h) used to perform file transfer are set in the "File transmission request (SD820)", the "File transfer status (SD554)" only changes to the awaiting execution status (-1), and actual processing is not yet performed. Perform processing by setting the execution command (FFFEh) in the "File transmission request (SD820)".
- If an axis No. (00h to 20h) or cam No. (000h to 400h) that has not been set in the system is set, the status returns to awaiting command acceptance (0), and the "File transfer status (SD554)" does not change to the awaiting execution status (-1).
- If any of the following occur while "File transfer status (SD554)" is being executed (-2), an error occurs, and file transfer is terminated. (The "File transmission request (SD820)" status changes to awaiting request acceptance (0).)

  • The target file does not exist. (Transferring from file to built-in memory)
  • The target file cannot be opened.
  • The target file is corrupt.
  • The target folder capacity is insufficient. (Transferring from built-in memory to file)
  • The content of the servo parameter file is incorrect.
  • The cam file content is incorrect.
  • The cam open area size is insufficient.

File transfer operation

• Operation when the file transfer target is a servo parameter file is as follows.

Request	Target axis	Operation
Built-in memory to file transfer	Any given 1 axis	• The target axis servo parameter open area content is written to the servo parameter file. • If an error occurs during execution, the servo parameter file is not updated.
	All axes	• The servo parameter open area content is written to the servo parameter file in order of the smallest system setting axis number first. • When transfer is complete for all axes, the "File transfer status (SD554)" changes to "0: Awaiting request acceptance". • If an error occurs with any of the files, transfer is terminated for the axis at which the error occurred and after.
File to built-in memory	Any given 1 axis	• The target axis servo parameter file content is read to the servo parameter open area. • If an error occurs during execution, the servo parameter open area is not updated.
	All axes	• The servo parameter file content is read to the servo parameter open area in order of the smallest axis number set in the system. • When transfer is complete for all axes, the "File transfer status (SD554)" changes to "0: Awaiting request acceptance". • If an error occurs with any of the files, transfer is terminated for the axis at which the error occurred and after.

• Operation when the file transfer target is a cam file is as follows.

Request	Target cam No.	Operation
File to built-in memory	Any given 1 file	• The target cam file content is read to the cam open area. • If an error occurs during execution, the cam open area is not updated.
	All cam files	• The content of the cam file in the folder is read to the cam open area one item at a time. • When transfer is complete for all axes, the "File transfer status (SD554)" changes to "0: Awaiting request acceptance". • If an error occurs for any files, expansion of that file is terminated, and the next cam file is transferred. (The "File transfer status (SD554)" changes to "-100: Error completion".)

Point

When the execution command (FFFEh) is accepted, "Cam data writing (SM505)" turns ON, and then turns OFF when file transfer is complete. The system will be executing a CAMRD, CAMWR, or CAMM command when the execution command is accepted, and therefore if "Operating cam data (SM505)" is ON, file transfer will not be executed, and the "File transfer status (SD554)" will change to error completion (-100).

File transfer procedure

The procedures used to transfer servo parameter files and cam files is shown below.

■Transferring servo parameter files from the built-in memory to the SD memory card

Operating procedure

1. Set the axis No. to be transferred to "File transmission request (SD820)". (Setting: 2001h to 2032h)
2. Ensure that the "File transfer status (SD554)" is "-1: Awaiting execution".
3. Set the "FFFEh: Execution command" for the "File transmission request (SD820)".
4. Ensure that the "File transfer status (SD554)" is "-2: Executing". (Performing file transfer)
5. Ensure that the "File transfer status (SD554)" is "0: Awaiting request acceptance". (File transfer complete)

■Transferring all standard ROM cam files to the cam open area

Operating procedure

1. Ensure that the "Cam data writing flag (SM505)" is OFF.
2. Set the "A000h" for the "File transmission request (SD820)".
3. Ensure that the "File transfer status (SD554)" is "-1: Awaiting execution".
4. Set the "FFFEh: Execution command" for the "File transmission request (SD820)".
5. Ensure that the "File transfer status (SD554)" is "-2: Executing". Ensure that the "Cam data writing flag (SM505)" is ON. (Performing file transfer)
6. Ensure that the "File transfer status (SD554)" is "0: Awaiting request acceptance". Ensure that the "Cam data writing flag (SM505)" is OFF. (File transfer complete)

4.8 File Transmission at Boot Function

By using the file transmission at boot function, operations such as the following can be performed when Multiple CPU system power supply is turned ON, or reset.

- Copy the parameters and programs on the standard ROM to the SD memory card.
- Copy the parameters and programs on the SD memory card to the standard ROM and startup Motion CPU.

Set the operation of the file transmission at boot function in [Motion CPU Common Parameter] → [Basic Setting] → "File Transmission Setting during Booting".

When the Multiple CPU system power supply is turned ON, file transmission at boot is executed as per the "File Transmission Setting during Booting".

⚠CAUTION

- Depending on the contents of the boot operation file, Motion CPU control can be changed just by installing the SD memory card. To avoid unexpected operations, check the data on the SD memory card before installing.
- Depending on the boot operation file, control data in the Motion CPU can be taken out from the CPU. To avoid the unauthorized reading/taking of data, use the security function. (☞ Page 173 Security Function)

File transmission at boot files

In file transmission at boot, the boot operation file, and boot log file are saved to the "$MMTPRJ$" folder of the SD memory card root folder.

Item	File name	Operation	File saving
Boot operation file	boot01.csv	Executes file transmission at boot after Multiple CPU system power supply is turned ON.	User saves the file in the "$MMTPRJ$" folder.
Boot log file	bootlog.txt	Stores the list of files that are read at the initial processing after Multiple CPU system power supply is turned ON, and the processing details of file transmission at boot. The contents are overwritten each time the Multiple CPU system power supply is turned ON.	System saves the file in the "$MMTPRJ$" folder.
Boot log file (previous boot log)	bootlog.bak	Renames the "bootlog.txt" file as "bootlog.bak" when the Multiple CPU system power supply is turned ON.	

Functions of the boot operation file

The operations specified by the boot operation file are shown below.

○: Can be specified, —: Can not specified (specified as blank)

Function (Transmit mode character string)	Operation	Setting items				Remarks
		File name	Source	Destination	Transmit mode	
File copy (copy)	Copies the specified file, or files in the specified folder.	○	○	○	○	When a file with the same name exists in the destination, the file is overwritten.
File move (move)	Moves the specified file, or files in the specified folder.	○	○	○	○	When a file with the same name exists in the destination, the file is overwritten. The source file is deleted.
File delete (delete)	Deletes the specified file, or specified folder.	○	—	○	○	For "delete", specify the source as blank.
Control data set (pathset)	Specifies the file to be used as control data. The system can be startup by reading a file from a different folder, without changing the standard ROM.	○	○	—	○	• For "pathset" specify the destination as blank. • The control data to be changed becomes the specified file in the parameter change function as well. • A servo parameter file cannot be specified to the file name.

Boot operation file content

The boot operation file is written in CSV (comma-separated values) format.Write CSV file records (1 line) as follows. There is no restriction on the number of records.

■Format (1 record)

[File name], [Source], [Destination], [Transmit mode]

Format	Character string	Details	Remarks
File name	Character string	Up to 63 characters	• Write the file (in the $MMTPRJ$ folder) of the control data to be transmitted. • Wildcard symbol may be used.
	Wildcard symbol	*: Any given character string ?: Any given character	
Source	/rom	Standard ROM	• Write the memory of the source. • When specifying file delete (delete), specify the source as blank.
	/sdc	SD memory card	
Destination	/rom	Standard ROM	• Write the memory of the destination. • When "/rom" is written, the files in the standard ROM are updated, and the Motion CPU controls with the updated data after the file transmission at boot is completed. • When specifying control data set (pathset) to the transmit mode, specify as blank. • When file copy (copy) or file move (move) is specified and the source and destination are the same, it is not processed.
	/sdc	SD memory card	
Transmit mode	copy	Fie copy	Write the transmit mode.
	move	File move	
	delete	File delete	
	pathset	Control data set	

Point

- When the specified file cannot be found, or the transmit mode cannot be determined, the file is not read and the next record (next line) is analysed.
- The files that are not specified by the boot operation file are read from the standard ROM.
- The characters for each field are not case-sensitive.
- By writing "//" at the beginning of a record (1 line), the character string is determined to be a comment line and is ignored, and analysis moves to the next record (next line).
- The character strings of the fields after the transmit mode are ignored, and the next record (next line) is analysed.
- When a boot operation file is in both the standard ROM and SD memory card, the boot operation file in the SD memory card is processed.
- When there are too many files to be processed by the boot operation file (boot01.csv) and it takes time to transmit all files, a moderate error (error code: 2460H) may occur after turning the Multiple CPU system power supply ON. Revise the files to be transferred.
- Copying and moving is not performed for programs that are locked by Motion CPU security.
- Copying and moving the boot operation file (boot01.csv) and boot log file (bootlog.txt) by file transmission at boot is not possible. The copy and move commands are ignored.
- When an error occurred during file transmission or security authentication, a moderate error (error code: 3070H to 3073H) is detected, and an error message is output to the boot log file (bootlog.txt).
- When an error is detected in the boot log file (bootlog.txt), a warning (error code: 0ED0H, 0ED1H) occurs.

■File types that can be specified

The files that can be specified to control data are shown below.

The maximum number of files that can be specified in control data set (pathset) is 512.

However, when using wildcard or specifying a folder, numerous files are selected with one specification.

When there is cam data in the folder specified for control data, the folder of the cam data files is switched. (A message for the change of the folder of the cam data is output to the boot log.)

Method of control data specification	File type	Remarks
Specification of files individually	■R series common parameter (/sys/) • System parameter file (SYSTEM.PRM) • CPU parameter file (CPU.PRM) • Module parameter file (UNIT.PRM) • Basic settings file (mot_sys.csv) ■Motion CPU common parameter (/sys/) • Servo network settings file (motnet01.csv, motnet02.csv) • High-speed input request signal settings file (fsinput.csv) • Mark detection setting file (markdt.csv) • Limit switch output settings file (limitout.csv) • Manual pulse generator connection settings file (mpulser.csv) • Vision system parameters files (vs_sys.csv, vs_prg.csv) • Head module settings file (rioref.csv) • Multiple CPU refresh (main cycle/operation cycle) settings file (fastref.csv) ■Motion control parameter (/motpara/) • Axis settings parameter file (axpara01.csv to axpara32.csv) • Parameter block file (para_blk.csv) • Servo input axis parameter file (in_servo.csv) • Synchronous encoder axis parameter file (in_enc.csv) • Command generation axis parameter file (in_cmgen.csv) • Synchronous parameter file (out01.csv to out32.csv) • Multiple CPU advanced synchronous control settings file (cpu_sync.csv) ■Servo program file (/prog/servo.prg) ■Motion SFC parameter file (/prog/motsfcpr.bin) ■Motion SFC program file (/prog/motsfc.prg) ■Label/structure file (GL_LABEL.IF2)	• Wildcard specification is possible. • Folder specification is possible. (Files in the folder are searched for, and the folder of each file is set. When there is cam data, the folder is switched in the same way as when "cam*.csv" is specified.)
Specification of files by file type	■Motion control parameter (/sync/) • Cam data file (cam*.csv)	• All cam data files (cam0001.csv to cam1024.csv) are specified by writing "cam*.csv". • When cam data files are specified individually, they are not processed. • When cam files are specified, the cam data of the specified folder is read at the Multiple CPU system power supply turning ON.
Cannot be specified	■Motion control parameter • Servo parameter file (svpara01.csv to svpara32.csv) ■Online change program file (df_f0000.prg to df_f4095.prg, df_g0000.prg to df_g4095.prg, df_k0000.prg to df_k4095.prg, df_sf000.prg to df_sf255.prg) ■Digital oscilloscope sampling data file (********.csv) ■Digital oscilloscope settings file (osc01.csv) ■Device comment file (DEVCMNT.DC2)	When control data is specified, it is not processed.

Description example

- Write all of the data in the "$MMTPRJ$" folder of the standard ROM to the SD memory card.

```
*, /rom, /sdc, copy
```

- Overwrite the standard ROM with the data in the "$MMTPRJ$/motpara" folder of the SD memory card.

```
/motpara/*, /sdc, /rom, move
```

- Delete all of the cam data files (cam0001.csv to cam1024.csv) in the "/sync" folder of the SD memory card.

```
/sync/cam*.csv, , /sdc, delete
```

- Read the data of "$MMTPRJ$/motpara/axpara01.csv" on the SD memory card, and startup the system.

```
/motpara/axpara01.csv, /sdc, , pathset
```

Precautions

- When a Motion SFC program file, or servo program file is specified, depending on whether an online change program file exists or not, the program may not operate as intended. Therefore before performing file transmission at boot, we recommend deleting the "/prog" folder of the destination using file delete (delete), then transmitting the entire "/prog" folder.

Ex.
Moving the data of the /prog folder on the SD memory card to the standard ROM

```
/prog/*, , /rom, delete
/prog/*, /sdc, /rom, move
```

- When an online change is performed on a Motion SFC program or servo program file, the change is not reflected on the program on the SD memory card.
- When "copy" or "move" from the SD memory card to the standard ROM is specified by the boot operation file, the file saved on destination Motion CPU is overwritten.
- Even if the parameter files are stored in the SD memory card, when the control data is not specified by the boot operation file, operation is conducted according to the parameter file settings in the Motion CPU.
- Make the module (Motion CPU model) of the program written to the SD memory card (program set by the boot operation file settings), and the Motion CPU model of the destination the same.
- When characters other than ASCII characters are used in the file name, a moderate error (error code: 3070H) occurs.
- When a wildcard specification is used in the file name, and characters other than ASCII characters are used in the file names in the SD memory card, a moderate error (error code: 3070H) occurs.

File transmission at boot procedure

The procedure for performing a file transmission at boot from the SD memory card to the standard ROM is shown below.

Create boot operation file

Using a personal computer, create the boot operation file (boot01.csv), and write the boot operation file (boot01.csv) to the "$MMTPRJ$" folder in the SD memory card.

Set parameters of the Motion CPU

Set the file transmission at boot parameters in [Motion CPU Common Parameter] → [Basic Setting] → "File Transmission Setting during Booting". (☞ Page 54 Basic setting)

Write the parameters to the Motion CPU, and turn Multiple CPU system power supply OFF to ON, or reset.

Point

The status of file transmission at boot can be checked with "Boot file transfer information (SD509)"

Write data to SD memory card

Install the SD memory card to the Motion CPU, and write the files to be used in file transmission at boot to the SD memory card using MT Developer2.

Execute file transmission at boot

Execute the boot operation file (boot01.csv) in the SD memory card by turning Multiple CPU system power supply ON to OFF, or reset.

The processing details of the file transmission at boot are stored in the standard ROM and SD memory card as a boot log file (bootlog.txt).

Point

Check the contents of the boot log file (bootlog.txt) using a personal computer to view the boot log file (bootlog.txt) in the "$MMTPRJ$" folder in the SD memory card.

Operation when security function is set

This section shows the operation when security function is set.
Refer to security function for the security function. (☞ Page 173 Security Function)

File password

If a file password is set to a file in the Motion CPU, the file password is authenticated at file transmission at boot.
When file passwords are set to files inside the boot operation file, files are transmitted only when all the file passwords of all of the files in the source and destination are matched.

■Transmitting from SD memory card to standard ROM

—: No such combination

Source (SD memory card) file		Destination (standard ROM) file		Password matched/ not matched*1	Transmission permitted
Files	File password setting	Files	File password setting		
Files are stored	File password set	Files are stored	File password set	Matched	Transmission permitted
				Not matched	Transmission not permitted*2
			No file password set	—	Transmission not permitted*2
		No files are stored	—	—	Transmission permitted
	No file password set	Files are stored	File password set	—	Transmission not permitted*2
			No file password set	—	Transmission permitted
		No files are stored	—	—	Transmission permitted

*1 When a read protect and a write protect password are set, if one of the passwords do not match, the file passwords are determined as not matched.
*2 A moderate error (error code: 3072H) occurs.

■Boot file transmission from standard ROM to SD memory card

—: No such combination

Source (standard ROM) file		Destination (SD memory card) file		Password matched/ not matched*1	Transmission permitted
Files	File password setting	Files	File password setting		
Files are stored	File password set	Files are stored	File password set	Matched	Transmission not permitted*2
				Not matched	Transmission not permitted*2
			No file password set	—	Transmission not permitted*2
		No files are stored	—	—	Transmission not permitted*2
	No file password set	Files are stored	File password set	—	Transmission not permitted*2
			No file password set	—	Transmission permitted
		No files are stored	—	—	Transmission permitted

*1 When a read protect and a write protect password are set, if one of the passwords do not match, the file passwords are determined as not matched.
*2 A moderate error (error code: 3072H) occurs.

Point

When performing file delete (delete), the files to be deleted will be deleted regardless of whether there is a file password set or not.

Security key

When a security key is set to a program file, and the security key of the program file does not match the security key of the Motion CPU, a moderate error (error code: 3072H) occurs, and file transmission is not performed. A moderate error (error code: 3072H) also occurs when a security key is not written to the Motion CPU.

■Transmitting from SD memory card to standard ROM

—: No such combination

Program file security key	Motion CPU security key	Security key matched/not matched	Transmission permitted
Security key set	Security key is written	Matched	Transmission permitted
		Not matched	Transmission not permitted*1
	Security key is not written	—	Transmission not permitted*1

*1 A moderate error (error code: 3072H) occurs.

■Boot file transmission from standard ROM to SD memory card

—: No such combination

Program file security key	Motion CPU security key	Security key matched/not matched	Transmission permitted
Security key set	Security key is written	Matched	Transmission not permitted*1
		Not matched	Transmission not permitted*1
	Security key is not written	—	Transmission not permitted*1

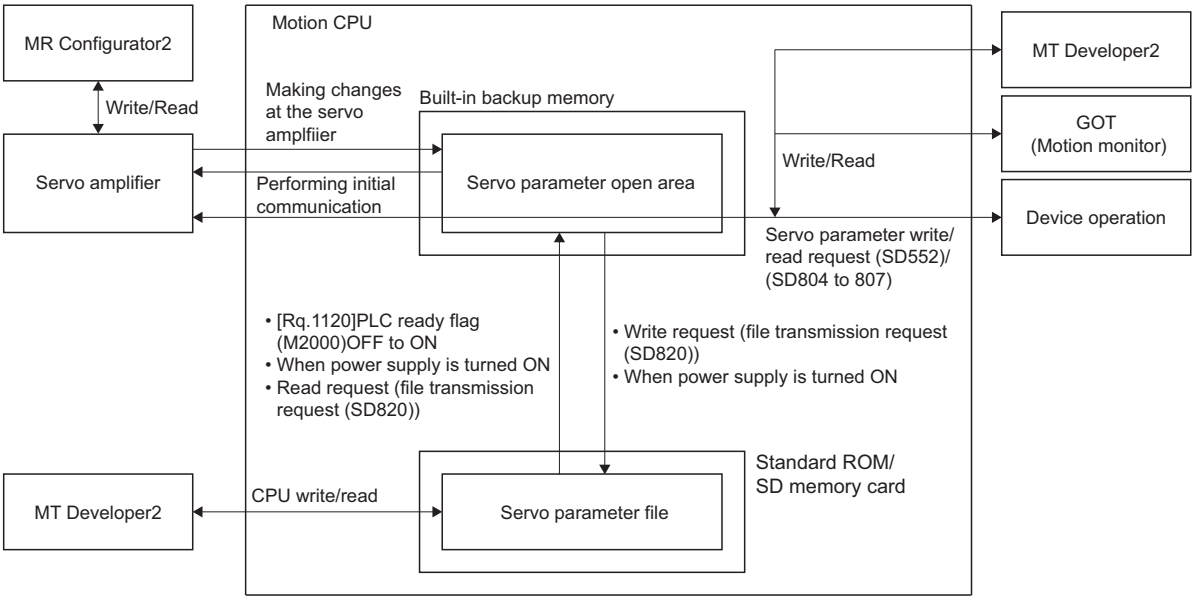
*1 A moderate error (error code: 3072H) occurs.

5 FUNCTIONS USED WITH SSCNET COMMUNICATION

5.1 Servo Parameter Management

Transmission of servo parameters

The Motion CPU stores servo parameters as a file, extracts them to the internal servo parameter open area (backup memory), and then communicates with the servo amplifier. The servo parameter storage area, and transfer timing is shown below.


MR Configurator2
Write/Read
Servo amplifier
Motion CPU
Making changes at the servo amplfiier
Built-in backup memory
Performing initial communication
Servo parameter open area
MT Developer2
GOT (Motion monitor)
Write/Read
Device operation
Servo parameter write/ read request (SD552)/ (SD804 to 807)
• [Rq.1120]PLC ready flag (M2000)OFF to ON
• When power supply is turned ON
• Read request (file transmission request (SD820))
• Write request (file transmission request (SD820))
• When power supply is turned ON
Standard ROM/ SD memory card
MT Developer2
CPU write/read
Servo parameter file

Managed servo parameters

Servo parameters managed by the Motion CPU are first extracted to the servo parameter open area, and are then automatically transferred to the servo amplifier when performing initial communication.

Point

If changes are made to the content of the servo parameter file, use the following procedure to update the changed content to the servo amplifier.

- Turn OFF or reset the Multiple CPU system.
- Turn the "[Rq.1120] PLC ready flag (M2000)" from OFF to ON (or, "File transfer flag (SD820)"), and then turn ON the servo amplifier control power supply again, or disconnect and then reconnect SSCNET communication.

If changes are also made to servo parameters for which it is necessary to reboot the servo amplifier control circuit power supply, it is first necessary to perform the procedure above, and then reboot the servo amplifier control circuit power supply again.

When parameters are updated at the servo amplfier side

When the servo parameters are changed by one of the causes below after communication with the servo amplifier has been established, the Motion CPU will automatically read the servo parameters and reflect them to the servo parameter storage area in the Motion CPU.

- The parameters are changed by auto tuning.
- The parameters are changed by connecting directly MR Configurator2 to the servo amplifier.

Point

- If the power supply of Multiple CPU system is turned off/reset or the power supply of servo amplifier is turned off immediately after change of parameters on the servo amplifier side, changes may not be reflected to the built-in memory or the servo parameter file.
- If changes are made to the servo parameter file content, and these changes are updated to the servo parameter open area inside the Motion CPU, any changes made to parameters at the servo will not be updated to the servo parameter open area inside the Motion CPU until updating of the changed parameter content to the servo amplifier is complete.
- When changes to the servo parameters need to be reflected to the MT Developer2 project, read the servo parameters from the Motion CPU and save data.

When the update of the servo parameter file is required

If the content of the servo parameter open area inside the Motion CPU changes, and it is necessary to update the servo parameter file, the relevant axis bit for the "Servo parameters change flag (SD556, SD557)" will turn ON, and changes will be automatically updated to the servo parameter file the next time the Multiple CPU system power supply is turned OFF or the system is reset. Furthermore, changes can be updated to the servo parameter file with a "File transmission request (SD820)". (The relevant axis bit turns OFF when the file update is complete.)

	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
SD556	Axis 16	Axis 15	Axis 14	Axis 13	Axis 12	Axis 11	Axis 10	Axis 9	Axis 8	Axis 7	Axis 6	Axis 5	Axis 4	Axis 3	Axis 2	Axis 1
SD557	Axis 32	Axis 31	Axis 30	Axis 28	Axis 28	Axis 27	Axis 26	Axis 25	Axis 24	Axis 23	Axis 22	Axis 21	Axis 20	Axis 19	Axis 18	Axis 17

Devices used

Explicit synchronization of servo parameters between areas can be performed with a special register. The special registers used and update target areas are shown below.

- Servo Parameter Read/Change Function(☞ Page 116 Servo Parameter Read/Change Function)
- File Transfer Function(☞ Page 103 File Transfer Function)

●: Update source, ○: Update target

Special register	Update target			
	Servo parameter file	Servo parameter open area	Servo amplifier	Device
Servo parameter write request (SD804)	—	○	○	●
Servo parameter read request (SD804)	—	○	●	○
File transmission request (SD820) (write)	○	●	—	—
File transmission request (SD820) (read)	●	○	—	—

Servo Parameter Read/Change Function

The servo parameters can be changed or displayed individually from Motion CPU. Use the following special registers to change or display the servo parameter.

"Servo parameter write/read request" device

No.	Name	Meaning	Details	Set by
SD552	Servo parameter write/read request	Servo parameter read value	The read value of servo parameter which executed "2: Read request" in SD804 is stored.	System(At reading request)
SD804*1		Servo parameter write/read request flag	• The "write/read request" is executed after setting of the axis No. and servo parameter No. 1: Write request 2: Read request • "0" is automatically set by Motion CPU after completion of servo parameter write/read request. ("-1" is stored by Motion CPU at write/read error.)	User/ System
SD805		Axis No.	The axis No. to write/read servo parameter is stored. R32MTCPU: 1 to 32 R16MTCPU: 1 to 16	User
SD806		Servo parameter No.	The servo parameter No. to be written/read is stored in hexadecimal. H □□□□ → Parameter No. → Parameter group No. • 0: PA • 5: PF • 1: PB • 9: Po • 2: PC • A: PS • 3: PD • B: PL (MR-J4(W)-□B only) • 4: PE • C: PT (MR-J4(W)-□B only) → Fixed to 0	
SD807		Servo parameter setting value	The setting value of servo parameter to be written is stored when "1: Write request" is set in SD804.	

*1 Do not execute the automatic refresh.

Procedure to servo parameter write/read

■Procedure to write

1. Set the axis No., servo parameter No. and servo parameter setting value in SD805 to SD807.
2. Set "1: Write request" in SD804.
3. Check that "0" is set in SD804. (Completion of write)

■Procedure to read

1. Set the axis No. and servo parameter No. in SD805 and SD806.
2. Set "2: Read request" in SD804.
3. Check that "0" is set in SD804. (Completion of read)
4. Stores the read value in SD552.

Point

- New servo parameter is reflected to Motion CPU, therefore, the servo parameter of Motion CPU side does not need to change.
- When the axis No., servo parameter No. or servo parameter setting value is outside the setting range, "-1: write/read error" is stored in the servo parameter write/read request flag. The setting value of servo parameter is reflected to Motion CPU even when the write error occurred. Be sure to set within the setting range.

5.2 Optional Data Monitor Function

The optional data monitor function is used to store data in the servo amplifier to a specified word device and monitor the data.
In the optional data monitor, there is registered monitor and transient command.
Refer to the following for details of the data types set by registered monitor and transient command.
📖 Servo amplifier Instruction Manual

Registered monitor

The registered monitor data is refreshed every operation cycle.
The data is stored in the device set by the storage device No..

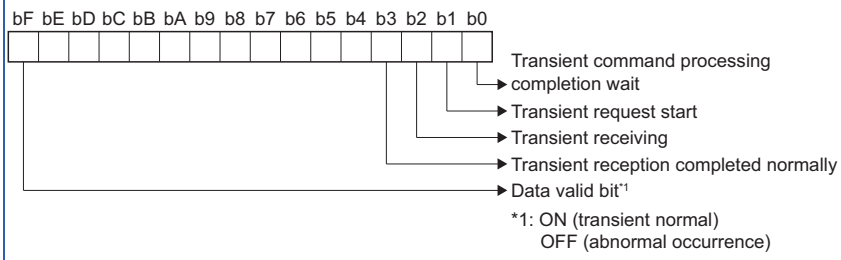
Transient command

Transient command data is sent and received asynchronously (one item at a time).
Although refreshing data with transient command is slower compared to registered monitor, transient command is used to receive data that is not required to be read in fixed cycles. Transient command can also send commands to the servo amplifier according to the data type.
The 12 points from the device set by the storage device No. are stored as transient send and receive data in the following manner.

■Transient send and receive data

"Control data" is automatically initialized according to the specified data type when the Multiple CPU system power supply is turned ON, and the result is stored to the "monitor data".
To change the data to be sent and received while the Multiple CPU system power supply is turned ON, change the transient command after setting the command send request as "0 (no request)".

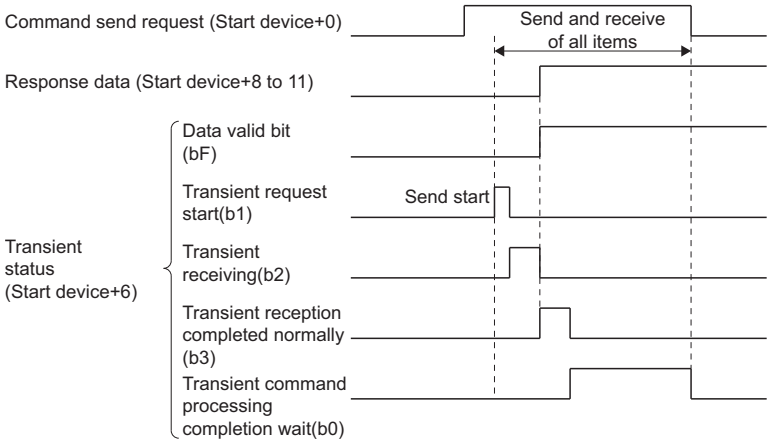
Offset	Item		Details
+0	Control data	Command send request	Requests send of transient command. The default value after Multiple CPU system power supply is turned ON is "2: Transient request (continuous send)". • If the value is changed while processing, the process is not interrupted. • For "1: Transient request (individual send)", all data is cleared to 0 upon the completion of all processes • Setting range 1: Transient request (individual send) 2: Transient request (continuous send) Other than 1: No request
+1		Transient command	Sets the transient command to be sent. • Without checking the value, the set value is sent to the servo amplifier as a command. Do not set values other than those that are set for transient commands as the servo amplifier operation for other values is not guaranteed. • When the issued command is a send command, it is recorded to the event history. • After Multiple CPU system power supply is turned ON, the command that supports the data type set by the parameter is stored as the initial value.
+2		Request data	Sets the request data. Can be used as a command option when using a send command such as alarm history clear command. • Without checking the value, the set value is sent to the servo amplifier as a command. • Set "0" when request data is not defined by command.
+3			
+4			
+5			

Offset	Item		Details
+6	Monitor data	Transient status	The process after sending transient request is stored. 
+7		Unusable	—
+8		Response data	The response data from the servo amplifier is stored. The response data includes valid data and invalid data (0), and is always stored as 4 words. • When SSCNETⅢ(/H) is disconnected, data is cleared to 0.
+9			
+10			
+11			

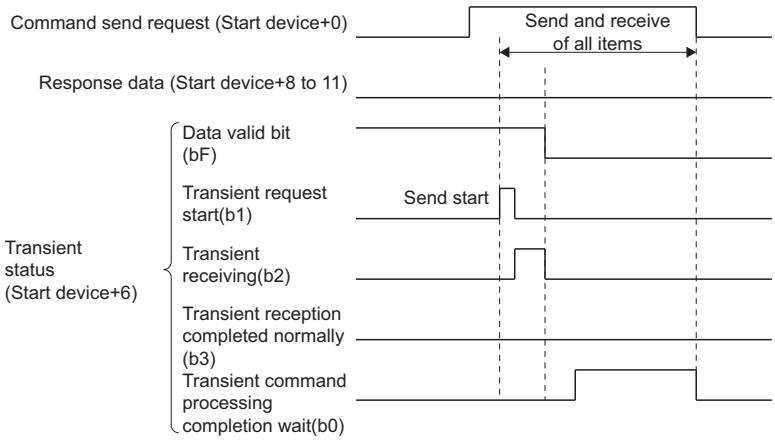
■Send and receive timing

The send and receive timing of transient send and receive data is shown below.

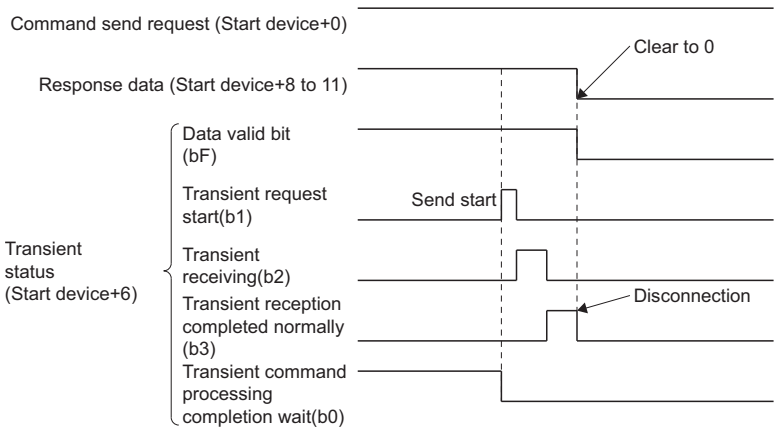
- Normal timing


Command send request (Start device+0)
Send and receive of all items
Response data (Start device+8 to 11)
Data valid bit (bF)
Transient request start(b1)
Send start
Transient status (Start device+6)
Transient receiving(b2)
Transient reception completed normally (b3)
Transient command processing completion wait(b0)

- Abnormal timing


Command send request (Start device+0)
Send and receive of all items
Response data (Start device+8 to 11)
Data valid bit (bF)
Transient request start(b1)
Send start
Transient status (Start device+6)
Transient receiving(b2)
Transient reception completed normally (b3)
Transient command processing completion wait(b0)

- When disconnected during continuous send



Point

- Response data is only updated when normal receive is completed.
- When an error occurs with the data valid bit (bF), it is kept until normal receive is completed.

Optional data monitor setting

This section explains the setting items of the optional data monitor.

Data for registered monitor and transient command data types per axis can be set for setting 1 to 14.

However, of the 14 settings, set no more than 6 settings of registered monitor data for SSCNETⅢ/H lines, and no more than 3 settings of registered monitor data for SSCNETⅢ lines.

[Motion Control Parameter] → [Axis Setting Parameter] → "Optional Data Monitor"

Item		Setting range	Default
Setting 1 to 14	Data type	☞ Page 121 Registered monitor ☞ Page 122 Transient command	0
	Address/Transient ID	H0000 to HFFFF	—
	Storage device No.	Word device	—

Data type

Set the total of number of communication data points per 1 axis so they are no more than the points shown below.

Servo amplifier	Total number of communication data points per 1 axis
MR-J4(W)-□B	Up to 6 points
MR-J4-□B-RJ*1	Up to 2 points
MR-J4-□B-LL	Up to 5 points
MR-J3(W)-□B	Up to 3 points

*1 When setting an axis of servo amplifier selected as "101: Synchronous encoder via servo amplifier" by "[Pr.320] Synchronous encoder axis type".

■Registered monitor

○: Settable, ×: Unsettable

Data type	Unit	Number of words	Number of communication data points	Servo amplifier		Remark
				MR-J3(W)-□B	MR-J4(W)-□B	
Effective load ratio	[%]	1	1	○	○	
Regenerative load ratio	[%]	1	1	○	○	
Peak load ratio	[%]	1	1	○	○	
Position feedback	[pulse]	2	0	○	○	
Encoder position within one revolution	[pulse]	2	0	○	○	
Encoder multiple revolution counter	[rev]	1	0	○	○	
Load inertia moment ratio	[×0.1]	1	1	○	○	
Load mass ratio						Linear servo motor use
Model loop gain	[rad/s]	1	1	○	○	
Main circuit bus voltage	[V]	1	1	○	○	
Cumulative current value*1	[Position command]*2	2	0	○	○	
Servo motor speed*3	[r/min]	1	1	○	○	
Servo motor speed*3	[mm/s]					Linear servo motor use
Selected droop pulse	[pulse]	2	2	○	○	
Module power consumption*4	[W]	1	1	×	○	
Module power consumption (2 words)*4	[W]	2	2	×	○	
Module integral power consumption*4	[Wh]	2	2	×	○	
Instantaneous torque	[0.1%]	1	1	×	○	
Instantaneous thrust						Linear servo motor use
Load-side encoder information 1	[pulse]	2	2	○	○	Fully closed control or synchronous encoder via servo amplifier use
Load-side encoder information 2	—	2	2	○	○	
Z-phase counter	[pulse]	2	2	×	○	Linear servo motor use
Servo motor thermistor temperature	[℃]	1	1	○	○	
Disturbance torque	[0.1%]	1	1	×	○	
Disturbance thrust						Linear servo motor use
Overload alarm margin	[0.1%]	1	1	×	○	
Error excessive alarm margin	[16pulse]	1	1	×	○	
Settling time	[ms]	1	1	×	○	
Overshoot amount	[pulse]	1	1	×	○	
Servo motor side/load-side position deviation	[pulse]	2	2	×	○	Fully closed control use
Servo motor side/load-side speed deviation	[0.01r/min]	2	2	×	○	
Servo command value*1*5	[pulse]	2	0	○	○	
Torque command*1*6	[0.1%]	1	0	○	○	
Pressure command	—	1	0	×	○	MR-J4-□B-LL use
Load cell pressure	—	1	0	×	○	
Optional address of registered monitor	—	1	1	○	○	

*1 The "Cumulative current value", "Servo command value", and "Torque command" are all command values for the servo amplifier. All other data types are servo amplifier monitor values (feedback).

*2 Position commands are in the command unit set at [Motion Control Parameter] → [Axis Setting Parameter] → "Fixed Parameter" → "Unit setting".

*3 The speed will be the average of every 227[ms]. Use a servo amplifier version compatible with this monitor. The result will always be 0 if monitoring is performed with an incompatible servo amplifier.

*4 In the servo amplifier for multiple axes, the measured value of whole unit is monitored. When these values set to each axis of MR-J4 multi-axis servo amplifier, the same value can be monitored in each axis. Use the monitored value of not each axis but each module to calculate the module power consumption power consumption and unit integral power consumption of multiple modules.

*5 The servo amplifier command value is a command value for the servo amplifier. Coordinates differ from those for the Motion CPU, and therefore the result will not be 0 even if the home position is set.

*6 The torque command value is a command value for the servo amplifier. Torque command values are only valid in speed-torque control torque control mode and continuous operation torque control mode. The previous value will remain for the torque command value when restoring to position control from torque control, etc., however, it is not actually used.

■Transient command

○: Settable, ×: Unsettable

Data type	Unit	Number of words[*1]	Number of communication data points	Servo amplifier		Transient ID	Storage device (response data (+8 to 11)) content[*2]	Remark
				MR-J3(W)-□B	MR-J4(W)-□B			
Servo motor ID (SSCNETⅢ)/ Encoder ID	—	3	0	○	○	0304h	+8: Motor ID +10: Encoder ID	
Servo motor ID (SSCNETⅢ/H)	—	2	0	×	○	0309h		
Encoder resolution	[pulse]	2	0	○	○	0305h		
Servo amplifier serial number (First 8 characters)	[characters]	4	0	×	○	0306h		
Servo amplifier serial number (Last 8 characters)	[characters]	4	0	×	○	0307h		
Servo amplifier recognition information (First 8 characters)	[characters]	4	0	○	○	0310h		
Servo amplifier recognition information (Last 8 characters)	[characters]	4	0	○	○	0311h		
Servo amplifier software number (First 8 characters)	[characters]	4	0	○	○	0312h		
Servo amplifier software number (Last 8 characters)	[characters]	4	0	○	○	0313h		
Power ON cumulative time	[h]	2	0	○	○	0319h		
Inrush relay ON/OFF number	[times]	2	0	○	○	031Ah		
Read alarm history number	[items]	1	0	○	○	0323h		
Alarm history/Detail #1, #2	—	4	0	○	○	0324h	+8: Alarm history #1 +9: Alarm detail #1 +10: Alarm history #2 +11: Alarm detail #2	
Alarm history/Detail #3, #4	—	4	0	○	○	0325h	+8: Alarm history #3 +9: Alarm detail #3 +10: Alarm history #4 +11: Alarm detail #4	
Alarm history/Detail #5, #6	—	4	0	○	○	0326h	+8: Alarm history #5 +9: Alarm detail #5 +10: Alarm history #6 +11: Alarm detail #6	
Alarm history/Detail/ Occurrence time	—/[h]	4	0	○	○	0328h	+8: Alarm history number #(N+1) +9: Alarm history number #(N+1) detail +10: Alarm history number #(N+1) occurrence time (2 words)	
Alarm occurrence time #1, #2	[h]	4	0	○	○	0329h	+8: Alarm occurrence time #1 (2 words) +10: Alarm occurrence time #2 (2 words)	
Alarm occurrence time #3, #4	[h]	4	0	○	○	032Ah	+8: Alarm occurrence time #3 (2 words) +10: Alarm occurrence time #4 (2 words)	

Data type	Unit	Number of words[*1]	Number of communic-ation data points	Servo amplifier		Transient ID	Storage device (response data (+8 to 11)) content[*2]	Remark
				MR-J3(W)-□B	MR-J4(W)-□B			
Alarm occurrence time #5, #6	[h]	4	0	○	○	032Bh	+8: Alarm occurrence time #5 (2 words) +10: Alarm occurrence time #6 (2 words)	
Alarm history clear command	—	1	0	○	○	0382h		
Home position [command unit]	[pulse]/[rev]	3	0	○	○	0408h	+8: Home position within one revolution (2 words) +11: Home position multiple revolution counter	
Main circuit bus voltage	[V]	1	0	○	○	040Ah		
Regenerative load ratio	[%]	1	0	○	○	040Bh		
Effective load ratio	[%]	1	0	○	○	040Ch		
Peak load ratio	[%]	1	0	○	○	040Dh		
Estimate inertia moment ratio	[× 0.1]	1	0	○	○	040Eh		
Model loop gain	[rad/s]	1	0	○	○	040Fh		
LED display	[characters]	2	0	○	○	0410h	+8: Lower 2 digits +9: Higher 2 digits	
Load-side encoder information 1	[pulse]	2	0	○	○	0416h		Fully closed control or synchronous encoder via servo amplifier use
Load-side encoder information 2	[pulse]	2	0	○	○	0417h		
Speed feedback	[0.01mm/s]	2	0	○	○	0418h		Linear servo motor use
Servo motor thermistor temperature	[℃]	1	0	○	○	0419h		
Z-phase counter	[pulse]	2	0	×	○	041Ah		Linear servo motor use
Module power consumption	[W]	2	0	×	○	0424h		
Module integral power consumption	[Wh]	2	0	×	○	0425h		
Disturbance torque	[0.1%]	1	0	×	○	0427h		
Instantaneous torque	[0.1%]	1	0	×	○	0428h		
Overload alarm margin	[0.1%]	1	0	×	○	0429h		
Error excessive alarm margin	[pulse]	2	0	×	○	042Ah		
Settling time	[ms]	1	0	×	○	042Bh		
Overshoot amount	[pulse]	1	0	×	○	042Ch		
Servo motor side/load-side position deviation	—	2	0	×	○	042Dh		Fully closed control use
Servo motor side/load-side speed deviation	—	2	0	×	○	042Eh		
Machine diagnostic status	—	1	0	×	○	042Fh	+8: Machine diagnostic status	

Data type	Unit	Number of words[*1]	Number of communication data points	Servo amplifier		Transient ID	Storage device (response data (+8 to 11)) content[*2]	Remark
				MR-J3(W)-□B	MR-J4(W)-□B			
Friction estimation data	[0.1%]	4	0	×	○	0430h	+8: Forward rotation torque Coulomb friction [0.1%] +9: Forward rotation torque Friction torque at rated speed [0.1%] +10: Reverse rotation torque Coulomb friction [0.1%] +11: Reverse rotation torque Friction torque at rated speed [0.1%]	
Vibration estimation data	[Hz/0.1%]	4	0	×	○	043h	+8: Motor stopped Oscillation frequency [Hz] +9: Motor stopped Vibration level [0.1%] +10: Motor operating Oscillation frequency [Hz] +11: Motor operating Vibration level [0.1%]	
Optional transient command	—	4	0	○	○	—		

*1 Number of words for response data (+8 to 11).

*2 Refer to the following for details on the content stored in response data (+8 to 11).
Servo amplifier Instruction Manual

Address/Transient ID

Set when the registered monitor "Optional address of registered monitor", or transient command "Optional transient command" is set.

Data type	Input range	Remarks
Optional address of registered monitor	H0000 to H03FE	Refer to the following for the address ID that can be set. 📖Servo amplifier Instruction Manual
Optional transient command	H0000 to HFFFF	Refer to transient command for the transient commands that can be set. (☞ Page 122 Transient command)

⚠CAUTION

• Do not set an address/transient ID other than those published in this manual. Setting an address/transient ID not published in this manual can cause the servo amplifier to perform an unpredictable operation.

Storage device No.

Specifies the word device for storing registered monitor data, or transient send and receive data.(☞ Page 66 Device List)

Point

• The updating cycle of registered monitor data is every operation cycle.
• Set an even numbered device No. when the data type of registered monitor data is two word data, or transient send and receive data.

Example of using transient commands

The following explains the operating procedure for setting the transient command data types "Friction estimation data", "Vibration estimation data", and "Optional transient command".

Friction estimation data/vibration estimation data

Setting "Friction estimation data" and "Vibration estimation data" to the optional monitor data settings does not enable the correct values to be stored. With the procedure below, perform machine diagnosis and store the values.

Operating procedure

1. In optional data monitor settings, set the transient command data type "machine diagnostic status", "friction estimation data", and "vibration estimation data".
2. Operate the servo motor for approximately 20 minutes in the operation pattern of servo parameter "Machine diagnosis function - Friction judgement speed (PF31)" until the diagnosis function is complete.
3. Check that the "forward rotation friction (b0 only)", "reverse rotation friction (b4 only)", and "vibration estimation (b8)" of the machine diagnostic status are ON, and the machine diagnosis is completed normally. When the values are not that of estimation completion and machine diagnosis fails, repeat the operating procedure starting from procedure 2.
4. Check the stored values in the devices set by "friction estimation data", "vibration estimation data".

Point

When the correct machine diagnosis conditions are not reached at the time of machine diagnosis estimation, the friction estimation data and vibration estimation data are not stored. Refer to the following manual to make sure the correct machine diagnosis conditions are reached.

Servo amplifier Instruction Manual

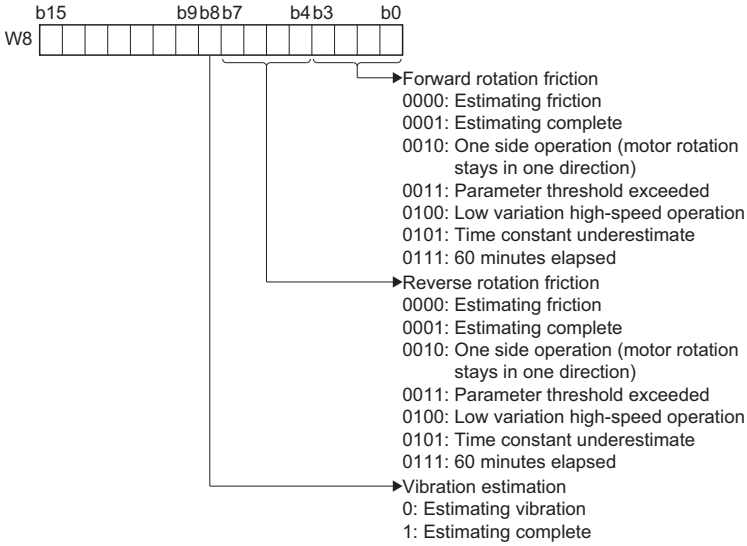
■Setting example

An example for setting "machine diagnostic status", "friction estimation data", and "vibration estimation data" in the data type of the optional data monitor is shown below.

Ex.

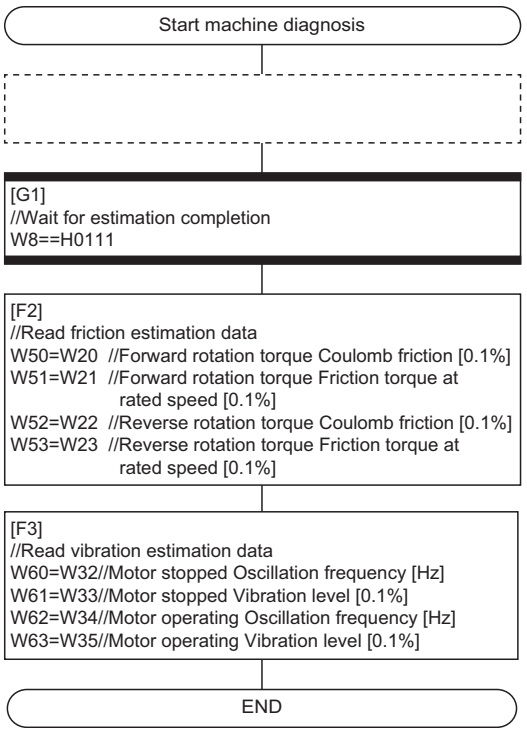
When setting "Setting 1 to Setting 3" of optional data monitor, and storing friction estimation data to "W50 to W53", and vibration estimation data to "W60 to W63"

• Optional data monitor setting

Item		Setting value	Remarks
Setting 1	Data type	Machine diagnostic status	The data returned by the machine diagnostic status is stored in W8. (Settings and operations are not performed in W0 to W7.) The friction estimation status can be checked as follows. 
	Address/Transient ID	—	
	Storage device No.	W0	

Item		Setting value	Remarks
Setting 2	Data type	Friction estimation data	When friction estimation is completed normally, friction estimation data is stored to the following devices. (Settings and operations are not performed in W12 to W19.) • W20: Forward rotation torque Coulomb friction [0.1%] • W21: Forward rotation torque Friction torque at rated speed [0.1%] • W22: Reverse rotation torque Coulomb friction [0.1%] • W23: Reverse rotation torque Friction torque at rated speed [0.1%]
	Address/Transient ID	—	
	Storage device No.	W12	
Setting 3	Data type	Vibration estimation data	When vibration estimation is completed normally, vibration estimation data is stored to the following devices. (Settings and operations are not performed in W24 to W31.) • W32: Motor stopped Oscillation frequency [Hz] • W33: Motor stopped Vibration level [0.1%] • W34: Motor operating Oscillation frequency [Hz] • W35: Motor operating Vibration level [0.1%]
	Address/Transient ID	—	
	Storage device No.	W24	

• Motion SFC program


Start machine diagnosis
[G1]
//Wait for estimation completion
W8==H0111
[F2]
//Read friction estimation data
W50=W20 //Forward rotation torque Coulomb friction [0.1%]
W51=W21 //Forward rotation torque Friction torque at rated speed [0.1%]
W52=W22 //Reverse rotation torque Coulomb friction [0.1%]
W53=W23 //Reverse rotation torque Friction torque at rated speed [0.1%]
[F3]
//Read vibration estimation data
W60=W32//Motor stopped Oscillation frequency [Hz]
W61=W33//Motor stopped Vibration level [0.1%]
W62=W34//Motor operating Oscillation frequency [Hz]
W63=W35//Motor operating Vibration level [0.1%]
END

*: Refer to the following manual, and conduct the machine diagnosis estimation operation pattern
Servo amplifier Instruction Manual

Optional transient command

If using optional transient commands, any given data type can be stored in response data devices (+8 to 11) by inputting the transient ID from a GOT etc. to the device set in the transient command (+1) of transient send data.

■Setting example

An example for using optional transient commands is shown below.

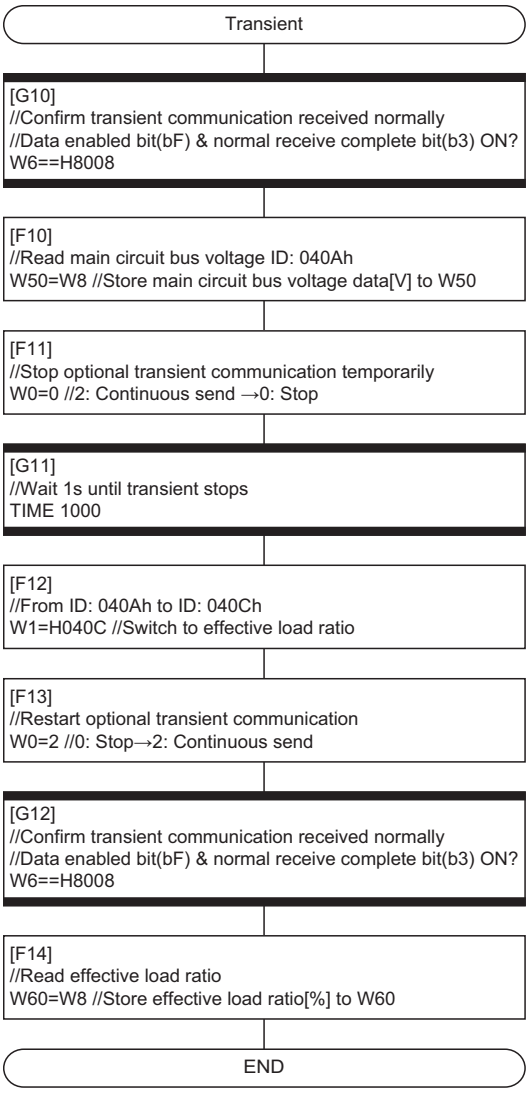
Ex.

When switching to "effective load ratio" and storing, after storing "main circuit bus voltage".

- Optional data monitor setting

Item		Setting value
Setting 1	Data type	Optional transient command
	Address/Transient ID	H040A
	Storage device No.	W0

- Motion SFC program



5.3 SSCNET Control Function

The following controls are possible in the SSCNET control function.

Function	Application
Connect/disconnect of SSCNET communication	Temporarily connect/disconnect of SSCNET communication is executed during Multiple CPU system's power supply ON. This function is used to exchange the servo amplifiers or SSCNETⅢ cables.
Start/release of amplifier-less operation	Start/release of amplifier-less operation is requested. This function is used to confirm the operation without connection of the servo amplifies.

Device list

Set the request in "SSCNET control (command) (SD803)", and the process status is stored in "SSCNET control (status) (SD508)".

■SSCNET control (status) devices

Device No.	Overview	Set by
SD508	The execute status *1 of the SSCNET control is stored.	System

Monitoring value	Status	Contents
0	Command accept waiting	Connect/disconnect command of SSCNET communication or start/release command of amplifier-less operation is in the status that can be accepted.
-1	Execute waiting	SD508 is waiting for connect/disconnect execute command after accepting the connect/disconnect command of SSCNET communication or start/release of amplifier-less operation.
-2	Executing	Connect/disconnect of SSCNET communication or start/release of amplifier-less operation is in process.

*1 The status for amplifier-less operation status is set in the "amplifier-less operation status flag (SM508)". (☞ Page 133 Amplifier-less operation function)

■SSCNET control (command) devices

Device No.	Overview	Set by
SD803	Set the SSCNET control command.	User

Setting value	Command	Contents	Connect/ Disconnect	Amplifier -less operation
0	No command	Set “0” if there is no command.	○	○
1 to 32	Disconnect command of SSCNET communication	Set axis No. “1 to 32” to be disconnected.	○	
-10	Connect command of SSCNET communication	Set “-10” to connect axis while disconnecting.	○	
-20	Start command of amplifier-less operation	Set to change from the normal operation to amplifier-less operation.		○
-25	Release command of amplifier-less operation	Set “-25” to change from the amplifier -less operation to normal operation.		○
-2	Execute command	Set “-2” to execute the processing when the status (SD508) is execute waiting after setting the value of each command.	○	○

Connect/disconnect function of SSCNET communication

Temporarily connect/disconnect of SSCNET communication is executed during Multiple CPU system's power supply ON. This function is used to exchange the servo amplifiers or SSCNET cables. Set the request for the connect/disconnect of SSCNET communication in "SSCNET control (command) (SD803)", and the status for the command accept waiting or execute waiting is stored in "SSCNET control (status) (SD508)". Use this device to connect the servo amplifiers disconnected by this function. When the power supply module of head axis of each SSCNET line (servo amplifier connected directly to the Motion CPU module) turns OFF/ON, this function is not necessary.

Point

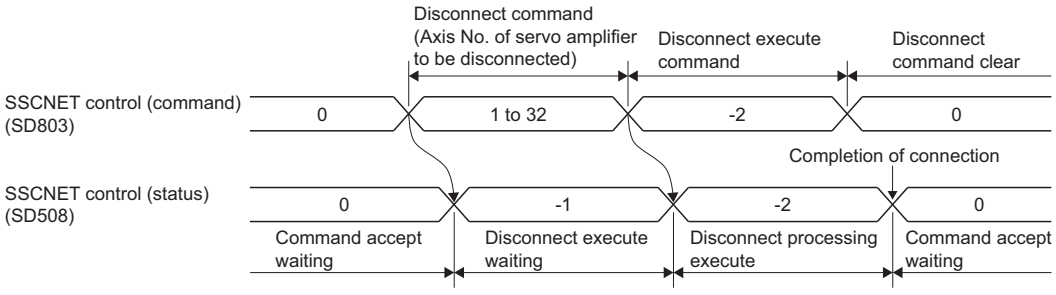
- Servo amplifiers connected after the axis specified for SSCNET communication disconnect processing are also disconnected. Confirm the LED display of the servo amplifier for "AA" after completion of SSCNET communication disconnect processing. And then, turn OFF the servo amplifier's power supply.
- The "SSCNET control (status) (SD508)" only changes into the execute waiting status (-1) even if the disconnect command of SSCNET communication (1 to 32) or connect command of SSCNET communication (-10) is set in "SSCNET control (command) (SD803)". The actual processing is not executed. Set the execute command (-2) in "SSCNET control (command) (SD803)" to execute.
- When the disconnect command of SSCNET communication (1 to 32) is set to axis not disconnect, the "SSCNET control (status) (SD508)" returns the command accept waiting status (0) without entering the execute waiting status (-1).
- Operation failure may occur in some axes if the servo amplifier's power supply is turned OFF without using the disconnect function. Be sure to turn OFF the servo amplifier's power supply by the disconnect function.
- When the connect/disconnect command is executed to the axis allocated to B-axis and C-axis of MR-J4W-□B or B-axis of MR-J3W-□B, it can be disconnected, however it cannot be reconnected. Execute the connect/disconnect command to the A-axis.
- Only the release command of amplifier-less operation can be accepted during amplifier-less operation. The connect/disconnect command cannot be accepted.
- If using the connect/disconnect function of SSCNET communication in a system used to perform driver communication, connection/disconnection is only possible at the first axis (the servo amplifier directly connected to Motion CPU). (☞ Page 138 Precautions during control)

Procedure to connect/disconnect of SSCNET communication

Procedure to connect/disconnect at the exchange of servo amplifiers or SSCNETⅢ cables is shown below.

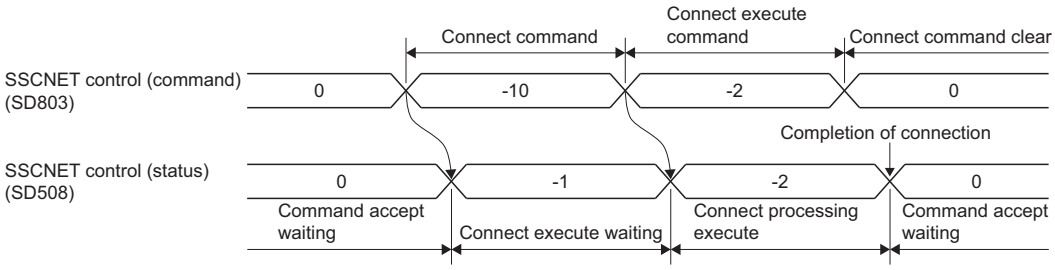
■Procedure to disconnect

1. Set the axis No. to disconnect in "SSCNET control (command) (SD803)". (Setting value: 1 to 32)
2. Check that "-1: Execute waiting" is set in "SSCNET control (status) (SD508)". (Disconnect execute waiting)
3. Set "-2: Execute command" in "SSCNET control (command) (SD803)".
4. Check that "0: Command accept waiting" is set in "SSCNET control (status) (SD508)". (Completion of disconnection)
5. Turn OFF the servo amplifier's power supply after checking the LED display "AA" of servo amplifier to be disconnected.



■Procedure to connect

1. Turn ON the servo amplifier's power supply.
2. Set "-10: Connect command of SSCNET communication" in "SSCNET control (command) (SD803)".
3. Check that "-1: Execute waiting" is set in "SSCNET control (status) (SD508)". (Connect execute waiting)
4. Set "-2: Execute command" in "SSCNET control (command) (SD803)".
5. Check that "0: Command accept waiting" is set in "SSCNET control (status) (SD508)". (Completion of connection)
6. Resume operation of servo amplifier after checking the "[St.1075] Servo ready (M2415+20n)" ON.

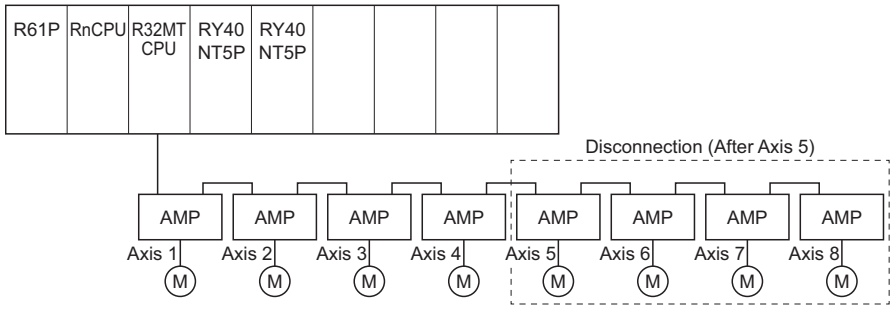


Program

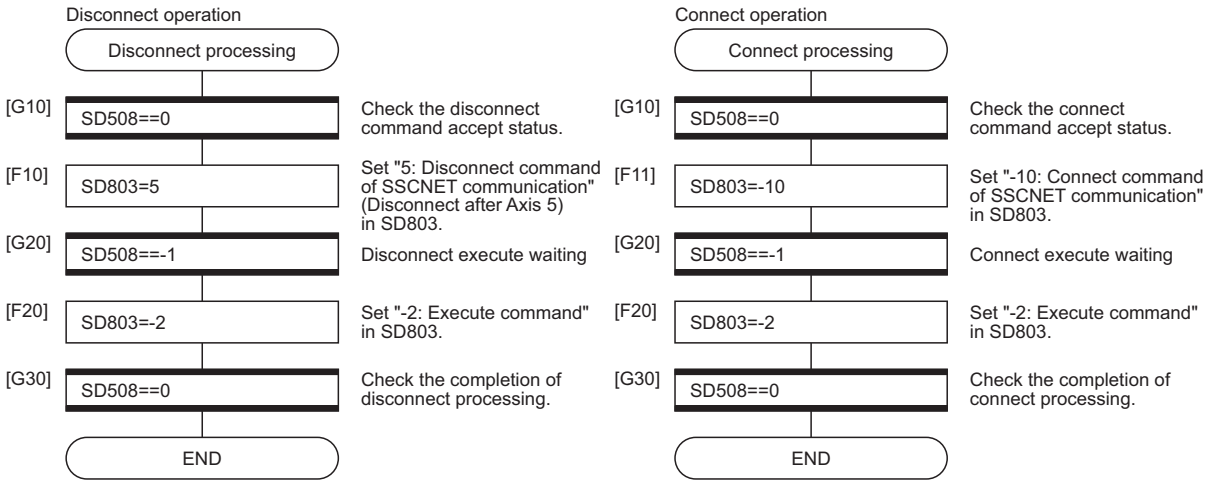
■Program to connect/disconnect the servo amplifiers after Axis 5 of self CPU

Procedure	Operation
Disconnect procedure	Turn OFF the servo amplifier's control circuit power supply after checking the LED display "AA" of servo amplifier.
Connect procedure	Resume operation of servo amplifier after checking the "[St.1075] Servo ready (M2415+20n)" ON.

System configuration



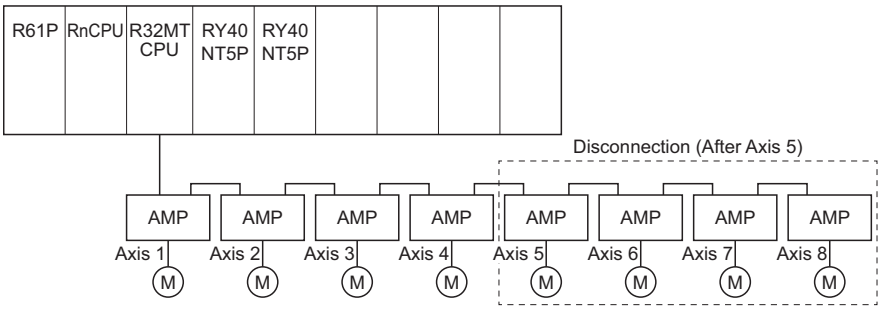
•Motion SFC program



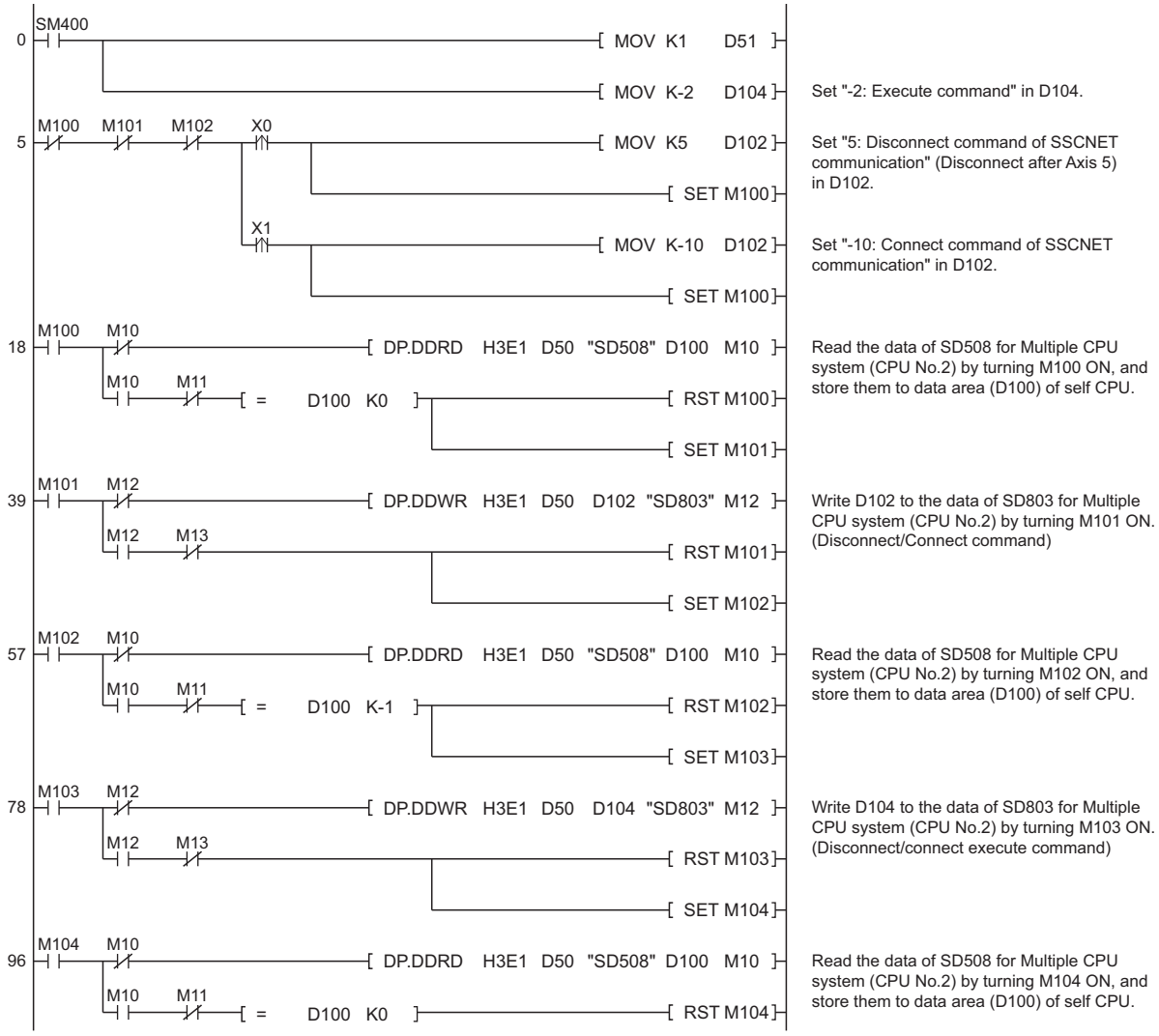
■Program to connect/disconnect the servo amplifiers after Axis 5 connected to the Motion CPU (CPU No.2) by the PLC CPU (CPU No.1).

Procedure	Operation
Disconnect procedure	Turn OFF the servo amplifier's control circuit power supply after checking the LED display "AA" of servo amplifier by turning X0 from OFF to ON.
Connect procedure	Resume operation of servo amplifier after checking the "[St.1075] Servo ready (M2415+20n)" of servo amplifier by turning X1 from OFF to ON.

System configuration



• Sequence program


0 SM400 [MOV K1 D51]
[MOV K-2 D104]
Set "-2: Execute command" in D104.
5 M100 M101 M102 X0 [MOV K5 D102]
[SET M100]
Set "5: Disconnect command of SSCNET communication" (Disconnect after Axis 5) in D102.
X1 [MOV K-10 D102]
[SET M100]
Set "-10: Connect command of SSCNET communication" in D102.
18 M100 M10 [DP.DDRD H3E1 D50 "SD508" D100 M10]
M10 M11 [= D100 K0]
[RST M100]
[SET M101]
Read the data of SD508 for Multiple CPU system (CPU No.2) by turning M100 ON, and store them to data area (D100) of self CPU.
39 M101 M12 [DP.DDWR H3E1 D50 D102 "SD803" M12]
M12 M13
[RST M101]
[SET M102]
Write D102 to the data of SD803 for Multiple CPU system (CPU No.2) by turning M101 ON. (Disconnect/Connect command)
57 M102 M10 [DP.DDRD H3E1 D50 "SD508" D100 M10]
M10 M11 [= D100 K-1]
[RST M102]
[SET M103]
Read the data of SD508 for Multiple CPU system (CPU No.2) by turning M102 ON, and store them to data area (D100) of self CPU.
78 M103 M12 [DP.DDWR H3E1 D50 D104 "SD803" M12]
M12 M13
[RST M103]
[SET M104]
Write D104 to the data of SD803 for Multiple CPU system (CPU No.2) by turning M103 ON. (Disconnect/connect execute command)
96 M104 M10 [DP.DDRD H3E1 D50 "SD508" D100 M10]
M10 M11 [= D100 K0]
[RST M104]
Read the data of SD508 for Multiple CPU system (CPU No.2) by turning M104 ON, and store them to data area (D100) of self CPU.

Amplifier-less operation function

This function is used to confirm for the operation without connecting the servo amplifiers at the starting or debugging. The start/release request of amplifier-less operation is set in "SSCNET control (command) (SD803)", and status of the command accepting waiting or execute waiting is stored in "SSCNET control (status) (SD508)". Confirm the amplifier-less operation status by the "Amplifier-less operation status flag (SM508)".

Point

- The "SSCNET control (status) (SD508)" only changes into the execute waiting status (-1) even if the start command of amplifier-less operation (-20) or release command of amplifier-less operation (-25) in "SSCNET control (command) (SD803)". The actual processing is not executed. Set the execute command (-2) in "SSCNET control (command) (SD803)" to executed.
- Only the release command of amplifier-less operation can be accepted during amplifier-less operation. The start command for the other amplifier-less operation cannot be accepted.
- The operation of servo motor or the timing of operation cycle, etc. at the amplifier-less operation is different from the case where the servo amplifiers are connected. Confirm the operation finally with a real machine.
- The amplifier-less operation becomes invalid immediately after the Multiple CPU system's power supply ON or reset.

Amplifier-less operation status flag

Device No.	Signal name	Overview	Set by
SM508	Amplifier-less operation status flag	The amplifier-less operation status is stored. OFF: During normal operation ON: During amplifier-less operation	System

Control details

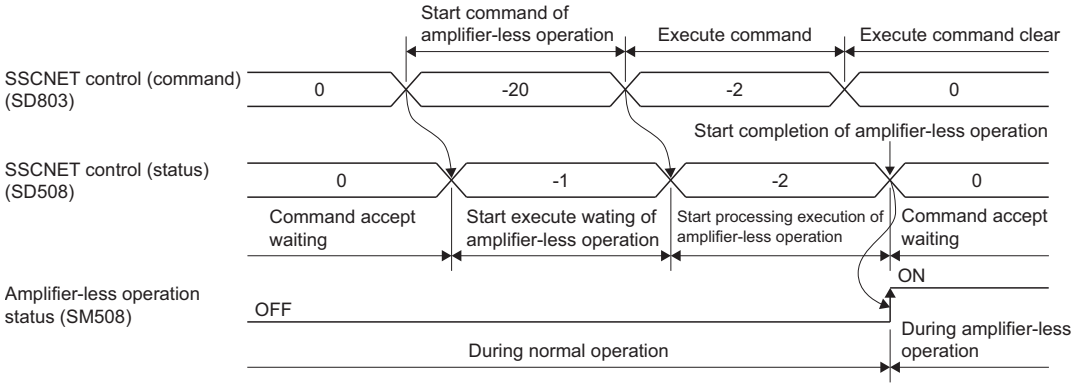
Operation during amplifier-less operation is shown below.

Item	Operation
Servo amplifier type	All axes set in the system setting are connected with the following type regardless of the setting details of system setting. ■For communication type "SSCNETⅢ/H" • Servo amplifier: MR-J4-10B • Servo motor: HF-KR053 ■For communication type "SSCNETⅢ" • Servo amplifier: MR-J3-10B • Servo motor: HF-KP053
Servo amplifier status	• Deviation counter value Always 0 • Motor speed Motor speed for the command • Motor current value At the amplifier-less operation start: "0" (The motor current value can be simulated during amplifier-less operation by changing the "[Md.104] Motor current (#8001+20n)" using the user program.) • Servo ready signal This signal changes depending on the status of "[Rq.1123] All axes servo ON command (M2042)" or "[Rq.1155] Servo OFF command (M3215+20n)". • Torque limiting signal This signal turns ON by the following condition. |Motor current value|≥Torque limit value *: When the positive direction and negative direction of torque limit value is set individually using CHGT instruction is as follows. |Motor current value|≥Positive direction torque limit or Negative direction torque limit value • Zero pass signal Always ON
Servo amplifier external signal (At the setting valid)	Each signals is shown below at the amplifier-less operation start. • [St.1071] External signals FLS (M2411+20n): Normal open: OFF/Normal close: ON • [St.1072] External signals RLS (M2412+20n): Normal open: OFF/Normal close: ON • [St.1074] External signals DOG/CHANGE (M2414+20n): Normal open: OFF/Normal close: ON The servo amplifier external signals can be operated during amplifier-less operation by turning ON/OFF the "[St.1071] External signals FLS (M2411+20n)", "[St.1072] External signals RLS (M2412+20n)" or "[St.1074] External signals DOG/CHANGE (M2414+20n)" using the user program.
Home position return	All home position return methods can be used.
Absolute position system	The absolute position is controlled as the normal servo amplifier connection. ■At the amplifier-less operation start The absolute position is restored by the saved absolute position data. The absolute position is restored as the travel value "0" during the servo amplifier's power supply OFF. ■During amplifier-less operation Suppose the servo motor operated during amplifier-less operation, and the absolute position data is refreshed. ■The servo amplifiers are connected after amplifier-less operation The absolute position is restored by the refreshed absolute position data and the actual motor position during amplifier-less operation.
Operation using MR Configurator2	Online operation and monitor of the servo amplifiers cannot be executed.
Optional data monitor	Only the following data types are possible. The other monitor values are "0". ■Registered monitor • Position feedback • Absolute position encoder single revolution position ■Transient command • Home position [command unit] • LED display
Driver communication	Cannot change to amplifier-less operation when connected and not connected servo amplifier axes are mixed. Change to amplifier-less operation when all axes are connected, or disconnect all axes of the servo amplifier.
SSCNETⅢ/H head module	The module is disconnected during amplifier-less operation.

Procedure to start/release of amplifier-less operation

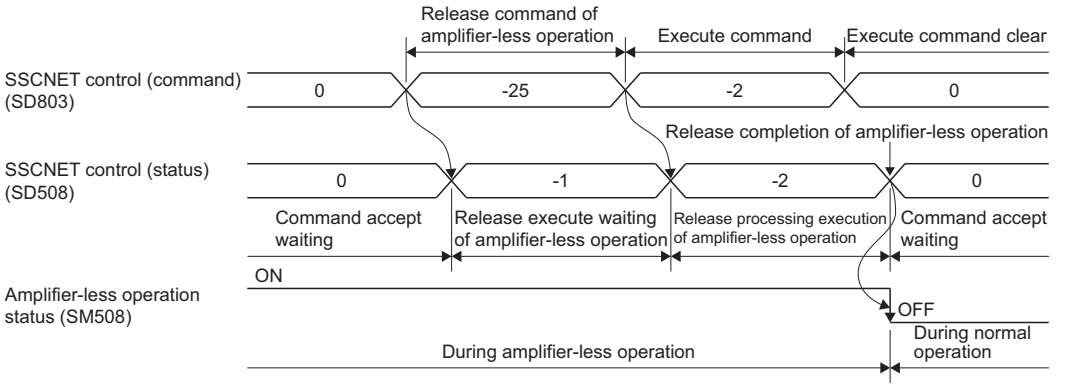
■Procedure to start

1. Set "-20: Start command of amplifier-less operation" in "SSCNET control (command) (SD803)".
2. Check that "-1: Execute waiting" is set in "SSCNET control (status) (SD508)". (Start processing execute waiting of amplifier-less operation)
3. Set "-2: Execute command" in "SSCNET control (command) (SD803)".
4. Check that "0: Command accept waiting" is set in "SSCNET control (status) (SD508)". (Start processing completion of amplifier-less operation)
5. Check that "ON: During amplifier-less operation" is set in "SSCNET control (status) (SD508)". Resume operation of servo amplifier after checking the "[St.1075] Servo ready (M2415+20n)" ON.



■Procedure to release

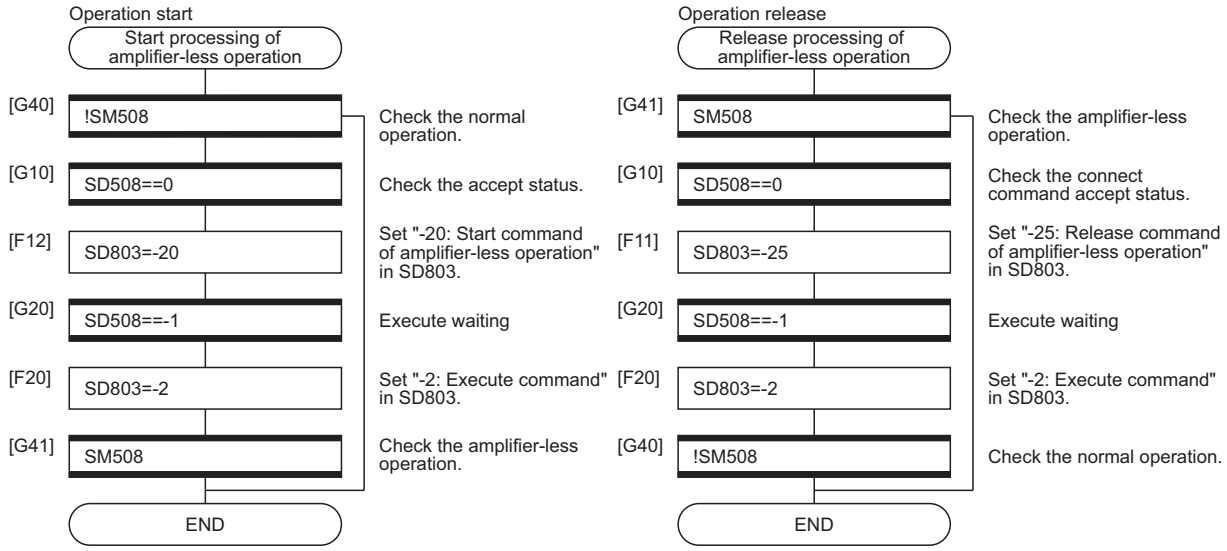
1. Set "-25: Release command of amplifier-less operation" in "SSCNET control (command) (SD803)".
2. Check that "-1: Execute waiting" is set in "SSCNET (status) (SD508)". (Release processing execute waiting of amplifier-less operation)
3. Set "-2: Execute command" in "SSCNET control (command) (SD803)".
4. Check that "0: Command accept waiting" is set in "SSCNET (status) (SD508)".
5. Check that "OFF: During normal operation" is set in "SSCNET (status) (SD508)". (Release processing completion of amplifier-less operation. When the servo amplifiers are connected, they are automatically reconnected.)



Program

■Program to start/release of amplifier-less operation for the self CPU

•Motion SFC program



5.4 Driver Communication Function

This function uses the "Master-slave operation function" of servo amplifier. The Motion CPU controls the master axis and the slave axis is controlled by data communication (driver communication) between servo amplifiers without going through the Motion CPU. This function is used for the case such as to operate the ball screw controlled by multiple axes via the belt. There are restrictions in the function that can be used by the version of the servo amplifier. Refer to the "Servo amplifier Instruction Manual" for details.

The following shows the number of settable axes for the master axis and slave axis.

—: No restriction

Model name	Number of SSCNETIII(/H) lines	Number of control axes	Combination of number of settable axes			Remark
			Master axis		Slave axis	
			SSCNETIII*1	SSCNETIII/H*2		
R32MTCPU	2 lines	32 axes	1 axis to 8 axes	1 axis to 16 axes	—	The axes other than the master axis and slave axis can be used as normal axis.
R16MTCPU	1 line	16 axes	1 axis to 4 axes	1 axis to 8 axes		

*1 Up to 4 axes per line are settable in the master axis.

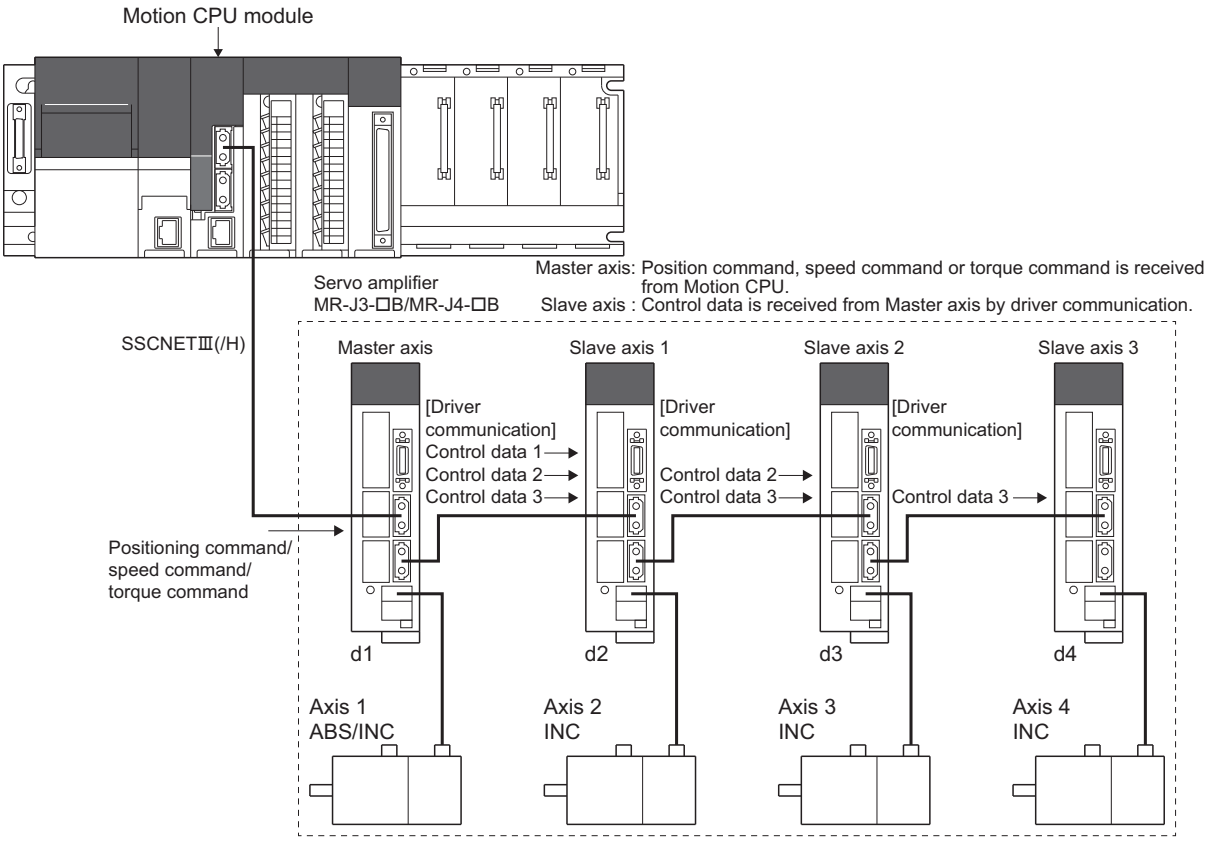
*2 Up to 8 axes per line are settable in the master axis.

Point

Driver communication function is only valid in MR-J3-□B and MR-J4-□B. MR-J4W-□B and MR-J3W-□B cannot be used. Nor can MR-J4W-□B be used in MR-J3-□B compatibility mode.

Control details

Set the master axis and slave axis in the servo parameter. Execute each control of Motion CPU in the master axis. (However, be sure to execute the servo ON/OFF of slave axis, and error reset at servo error occurrence in the slave axis.) The servo amplifier set as master axis receives command (positioning command, speed command, torque command) from the Motion CPU, and sends the control data to the servo amplifier set as slave axis by driver communication between servo amplifiers. The servo amplifier set as the slave axis is controlled by the control data transmitted from the master axis by driver communication between servo amplifiers.



Point

When a servo amplifier fails due to a SSCNETⅢ(/H) communication failure, communication with the axes after the failed axis cannot be executed. For this reason, be sure to connect the master axis to the position closest to the Motion CPU.

Precautions during control

⚠CAUTION

• During operation by driver communication function, the positioning control or JOG operation, etc. by servo program is not interrupted even if a servo error occurs in the slave axis. Be sure to stop the master axis by user program.

Servo amplifier

- For the axes where driver communication is executed, be sure to use a servo amplifier that supports driver communication.
- Driver communication function is only valid in MR-J3-□B and MR-J4-□B. MR-J4W-□B and MR-J3W-□B cannot be used. Nor can MR-J4W-□B be used in MR-J3-□B compatibility mode.
- Be sure to connect the master CPU and slave CPU in the same SSCNETⅢ(/H) line.
- The master CPU and slave CPU combination is set in the servo parameters. After writing the servo parameters, turn ON again or reset the Multiple CPU system power supply so that the parameters become valid.
- The differences between SSCNETⅢ and SSCNETⅢ/H communication method in driver communication function are shown below.

	Communication method	
	SSCNETIII	**SSCNETIII/H**
Communication with servo amplifiers after Multiple CPU system power supply ON.	Servo amplifiers cannot be operated until connection with all axes set by system setting is confirmed.	Servo amplifier cannot be operated until connection with all axes set to driver communication is confirmed. Normal axes (axes not set to driver communication) can also be connected after the network is established.
Connect/disconnect with servo amplifier	Only the first axis of the SSCNET line (servo amplifier connected directly to the Motion CPU) can connect/disconnect. Servo amplifiers other than the first axis can be disconnected but cannot be connected.	Only the first axis of the SSCNET line (servo amplifier connected directly to the Motion CPU) can connect/disconnect. Only normal axes (axes not set to driver communication) other than the first axis can be connected when they are disconnected. However, when axes set to driver communication are disconnected, they cannot communicate with servo amplifiers that were connected after disconnecting. (The servo amplifier's LED display remains "AA")

- If all axes set to driver communication are not detected at the start of communication with the servo amplifier, all axes connected to that line, including normal axes cannot be operated. (The servo amplifier's LED display remains "Ab"). Check with the following "SSCNETⅢ searching flag (Line 1) (SM532)"/"SSCNETⅢ searching flag (Line 2) (SM533)" if a SSCNET line can be operated. When all normal axes and axes set to driver communication are connected, the "SSCNETⅢ searching flag (Line 1) (SM532)"/"SSCNETⅢ searching flag (Line 2) (SM533)" turn OFF.

Device No.	Name	Details	Set by
SM532	SSCNETⅢ searching flag (Line 1)	• Turns ON when searching axes that have been set by system setting in line 1 or line 2. • Turns OFF when all axes that have been set by system setting in line 1 or line 2 have been searched. OFF: Search complete ON: Searching	S (Change status)
SM533	SSCNETⅢ searching flag (Line 2)		

Positioning dedicated device used for positioning control of slave axis

In the slave axis, only the following positioning dedicated devices are valid. Do not use devices other than the following.

■Axis status

- [St.1066] Zero pass (M2406+20n)*1
- [St.1068] Servo error detection (M2408+20n)
- [St.1075] Servo ready (M2415+20n)

*1 Because the slave axis cannot execute home position return, it does not use this in control.

■Axis command signal

- [Rq.1148] Servo error reset command (M3208+20n)
- [Rq.1155] Servo OFF command (M3215+20n)

■Axis monitor device

- [Md.1005] Servo error code (D8+20n)
- [Md.35] Torque limit value (D14+20n)

■JOG speed setting register

"[Cd.1110] JOG speed setting (D640+20n, D641+20n)" that apply to the slave axis become invalid.

■Common device

The following common devices that apply to the slave axis cannot be used. Do not use an interlock.

- [St.1040] Start accept flag (M2001 to M2032)
- [St.1047] Speed change accepting flag (M2061 to M2092)
- [St.1048] Automatic decelerating flag (M2128 to M2159)
- [St.1049] Speed change "0" accepting flag (M2240 to M2271)
- [St.1050] Control loop monitor status (M2272 to M2303)

Current position management

- Set "0: Used in incremental system" in " Absolute position detection system (PA03)" of servo parameter for slave axis.
- Because the slave axis is in torque control and operates by input from the master axis, current feed value and deviation counter are not updated. However, the real current value is updated. (During servo ON, the current feed value is not a value that reflects the motor movement amount. If servo is turned OFF, the current feed value is a value that reflects the motor movement amount. The deviation counter is always 0.)
- The "[St.1069] Home position return request (M2409+20n)" of slave axis is always ON but has no influence on the control of slave axis.
- During slave operation, the following slave axis external signals, and parameters are invalid.
  - Upper stroke limit signal (FLS)
  - Lower stroke limit signal (RLS)
  - Stop signal (STOP)
  - Upper/lower stroke limit value of fixed parameter
- Do not operate the slave axis by a method other than driver communication with the master axis. If operated by a method other than driver communication, commands to the servo amplifier become invalid and current feed value and other current position management cannot be guaranteed.

Servo program

Do not set the slave axis to the start axis of the servo program. When slave axis is started, the position commands to the servo amplifier become invalid.

Advanced synchronous control

- The master axis can be set to the servo input axis, or the output axis.
- When the slave axis is set to the servo input axis, set "[Pr.300] Servo input axis type" to "2: Real current value", or "4: Feedback value". When set to anything else, the slave axis does not operate as input axis.
- Do not set the slave axis to output axis. When the slave axis is set to output axis, the position commands to the servo amplifier become invalid.

Motion dedicated PLC instruction

Do not execute the following Motion dedicated PLC instructions for slave axis. When executed they become invalid.

- M(P).SVST/D(P).SVST (Start request of the specified servo program)
- M(P).SVSTD/D(P).SVSTD (Direct positioning start request)
- M(P).CHGV/D(P).CHGV (Speed change request of the specified axis)

Motion SFC program

Do not execute the following instructions for slave axis. When executed they become invalid.

- CHGV (Speed change request)
- CHGP (Target position change request)

Control mode of master axis

The control mode of the master axis can switch between position control mode, speed control mode, and torque control mode. For the master axis, when a switch to continuous operation to torque control mode is executed, there is a warning (error code: 09E8H), and the control mode does not switch.

Control mode of slave axis

- Because the slave axis is always controlled by torque mode, the control mode (b2, b3) of "[Md.108] Servo status1 (#8010+20n)" is in torque control mode ([0, 1]).
- Do not operate slave axis by speed-torque control. For the slave axis, when a control mode switch is executed, or is operated by speed-torque control, the speed-torque control commands become invalid.

Servo parameter

Set the following parameters for the axes that execute the master-slave operation.
(Refer to the following for details.)
Servo amplifier Instruction Manual

No.	Item	Setting details	Setting range	
			MR-J3-□B	MR-J4-□B
PA04	Function selection A-1	Set the forced stop input and forced stop deceleration function. • Set "0: Forced stop deceleration function disabled" for forced stop deceleration function selection.	0000h to 2100h	0000h to 2100h
PD15	Driver communication setting	Set the master axis and slave axis.	0000h to 0011h	0000h to 0011h
PD16	Driver communication setting Master transmit data selection 1	Set the transmitted data at master axis setting.	0000h to FFFFh	0000h to FFFFh
PD17	Driver communication setting Master transmit data selection 2		0000h to FFFFh	0000h to FFFFh
PD20	Driver communication setting Master axis No. selection 1 for slave	Set the axis No. (d1 to d16) of master axis at slave axis setting.	0 to 16	0 to 32
PD30	Master-slave operation Torque command coefficient on slave	Set the coefficient to reflect the internal torque command with the torque command value from the master axis.	0000h to 01FFh	0 to 500
PD31	Master-slave operation Speed limit coefficient on slave	Set the coefficient to reflect the internal speed limit command with the speed limit command value from the master axis.	0000h to 01FFh	0 to 500
PD32	Master-slave operation Speed limit adjusted value on slave	Set the lowest value of the internal speed limit.	0000h to 7FFFh	0 to 32767

Point

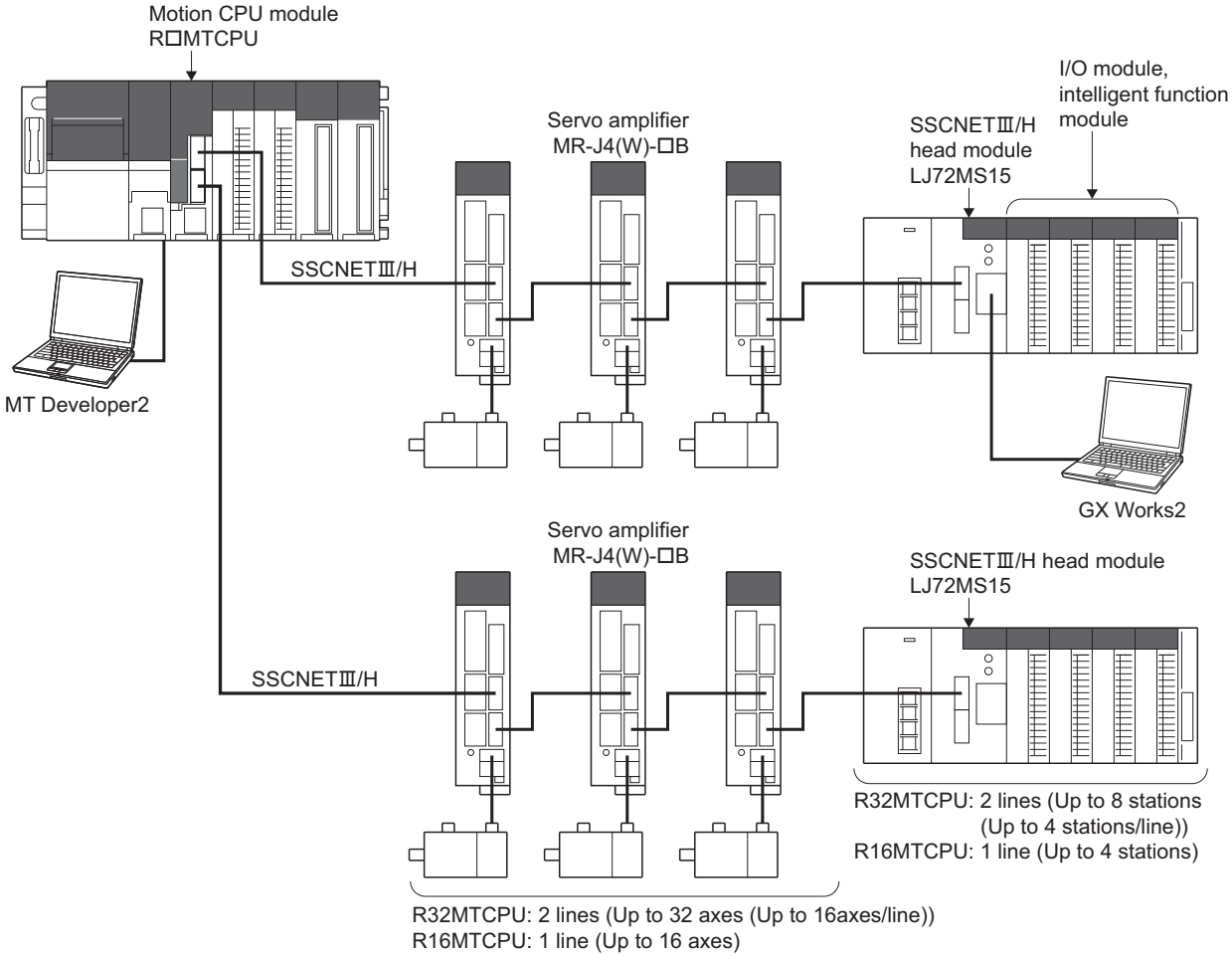
After writing the servo parameters to the Motion CPU, turn ON again or reset the Multiple CPU system power supply so that the parameters become valid.

5.5 Connection of SSCNETIII/H Head Module

The MELSEC-L series SSCNETⅢ/H head module (LJ72MS15) can be connected to R32MTCPU/R16MTCPU.

System configuration

A system configuration that uses SSCNETⅢ/H head modules is shown below.



Point

The parameters of the SSCNETⅢ/H head module and modules mounted to the SSCNETⅢ/H head module are set using GX Works2. Refer to the following for details of the SSCNETⅢ/H head module.

MELSEC-L SSCNETⅢ/H Head Module User's Manual

SSCNETIII/H head module parameters

Set the parameters used for connecting the SSCNETⅢ/H head module.

Servo network settings

Set "LJ72MS15" for the ampliifer setting in the servo network settings, and set the "RIO axis No.", "Station No. d", and "RIO axis label". (☞ Page 58 Amplifier setting)

Item			Setting range
Amplifier setting	Amplifier information	Amplifier model	LJ72MS15
	Axis information	RIO axis No.	R32MTCPU: 601 to 608 R16MTCPU: 601 to 604
		Station No. d	1 to 64
		RIO axis label	Up to 32 characters

Parameter setting of SSCNETIII/H head module

Set the parameters to use the SSCNETⅢ/H head module.

[Motion CPU Common Parameter] → [Head Module]

Item		Setting range	Default value
RIO axis No.		601 to 608	—
Refresh device setting (CPU side) (Input: RX, RWr/Output: RY, RWw)	Device name	Bit device name/Word device name	—
	Module I/O No./10h(**)	00 to FF	—
	Points	Bit device: 16 to 512 Word device: 1 to 32	—
	Start	Bit device/Word device	—
Status device		Bit device/Word device	—
Monitor device		Word device	—
Command device		Bit device/Word device	—

Point

- The number of SSCNETⅢ/H head module stations that can be connected to a SSCNETⅢ/H line according to operation cycle settings, are as follows.

Operation cycle [ms]	Stations connected
0.888	Up to 4 stations
0.444	Up to 2 stations
0.222	Up to 1 stations

■RIO axis No.

Display the SSCNETⅢ/H head module RIO axis No. and RIO axis label settings set in the servo network settings.
(For Motion SFC programs, this number is used for specifying).

■Refresh device setting (CPU side)

Set the device (Input: RX, RWr/Output: RY, RWw) for storage of link data. Motion CPU device is set using automatic refresh by cyclic transmission of the SSCNETⅢ/H head module. Link devices (RX, RWr, RY, RWw) of the Motion CPU are automatically assigned in MT Developer2.

Point

Link devices (RX, RWr, RY, RWw) of the Motion CPU are used only for internal processing. These cannot be used in user data such as Motion SFC programs etc.

- Device name
  Set the device name for the bit device or word device that stores link data. Refer to device list for bit device and word device names that can be set. (☞ Page 66 Device List)
- Module I/O No./10h(**)
  If a module access device (U□\G) is set for the device name, set the I/O No. for the module access device (U□\G) in which the link data being input is stored. Refer to device list for the range of module access devices (U□\G) that can be set. (☞ Page 66 Device List)
- Points
  Set the points of the device that stores link data. Set the points of the device in units of words. The total points for bits and words must be 64 bytes or less.

Device	Setting range
Bit device*1	16 to 512
Word device	1 to 32

*1 Set in units of 16 points (1 word).

- Start
  Set the start device number in which link data is stored with a bit device or word device. Refer to device list for the range of bit devices and word devices that can be set. (☞ Page 66 Device List)

■Status device

Set the device for storage of the status of the SSCNETⅢ/H head module with a bit device or word device.

- Refer to device list for the range of bit devices and word devices that can be set. (☞ Page 66 Device List)
- The device uses 16 points (1 point if a word device) from the specified device number. The details stored in the status device are shown below.

Off set	Signal name	Refresh cycle	Details
+0	Unusable	—	—
+1			
+2			
+3			
+4			
+5			
+6			
+7	During stop error	Operation cycle	Can be used to judge whether there is an error or not by the signal turning ON when a stop error is detected in the SSCNETⅢ/H head module. The applicable error code is stored in the error code signal of the monitor device set in Monitor device. (☞ Page 145 Monitor device) If error is reset by turning ON the error reset command, or turning ON the SSCNETⅢ/H head module power supply again, the signal turns OFF.
+8	Unusable	—	—
+9			
+10			
+11			
+12			
+13			
+14			
+15	During continue error	Operation cycle	Can be used to judge whether there is an error or not by the signal turning ON when a continue error is detected in the SSCNETⅢ/H head module. The applicable error code is stored in the error code signal of the monitor device set in Monitor device. (☞ Page 145 Monitor device) If error is reset by turning ON the error reset command, or turning ON the SSCNETⅢ/H head module power supply again, the signal turns OFF.

■Monitor device

Set the devices for monitoring the status of SSCNETⅢ/H head module with a word device.

- Refer to device list for the range of word devices that can be set. (☞ Page 66 Device List)
- The device uses 10 points per word from the specified device number. The details stored in the status device are shown below.

Off set	Signal name	Refresh cycle	Details
+0	Module operating status	Operation cycle	Stores the operating status of SSCNETⅢ/H head module. 0: No communication 1: STOP status 2: RUN status 3: ERROR status
+1	Error code		Stores the error code when an error is detected in the SSCNETⅢ/H head module. (Continue error and stop error) If error is reset by turning ON the error reset command, or the SSCNETⅢ/H head module power supply is turned ON again, this device is also cleared.
+2	Accumulative count for communication retry	At a communication retry	Holds the accumulative count for communication retry with the SSCNETⅢ/H head module.
+3	Maximum continuous times for communication retry		Counts each time a communication retry with the SSCNETⅢ/H head module occurs. When communication is successful, the count is "0".
+4	Unusable	—	—
+5			
+6			
+7			
+8			
+9			

■Command device

Set the device for issuing commands to the SSCNETⅢ/H head module with a bit device or word device.

- Refer to device list for the range of bit devices and word devices that can be set. (☞ Page 66 Device List)
- The device uses 16 points (1 point if a word device) from the specified device number. The details stored in the command device are shown below.

Off set	Signal name	Refresh cycle	Details
+0	Unusable	—	—
+1			
+2			
+3			
+4			
+5			
+6			
+7	Error reset command	Main cycle	Clears the error code storage device and resets the error code detection signal of the SSCNETⅢ/H head module. At an error reset command, turn this signal OFF after confirming the error detection signal of the SSCNETⅢ/H head module is turned OFF. However, depending on the error of the SSCNETⅢ/H head module, an error reset may not be executed, or conditions may apply to the error reset. In this case, the error code storage device is not cleared and the error code detection signal is not reset, even if an alarm reset is executed. Refer to the the following for details. 📖MELSEC-L SSCNETIII/H Head Module User's Manual
+8	Unusable	—	—
+9			
+10			
+11			
+12			
+13			
+14			
+15			

Operation example of parameter

When setting 2 SSCNETⅢ/H head modules (station 17, station 18) to SSCNET line 1.

■Parameter setting

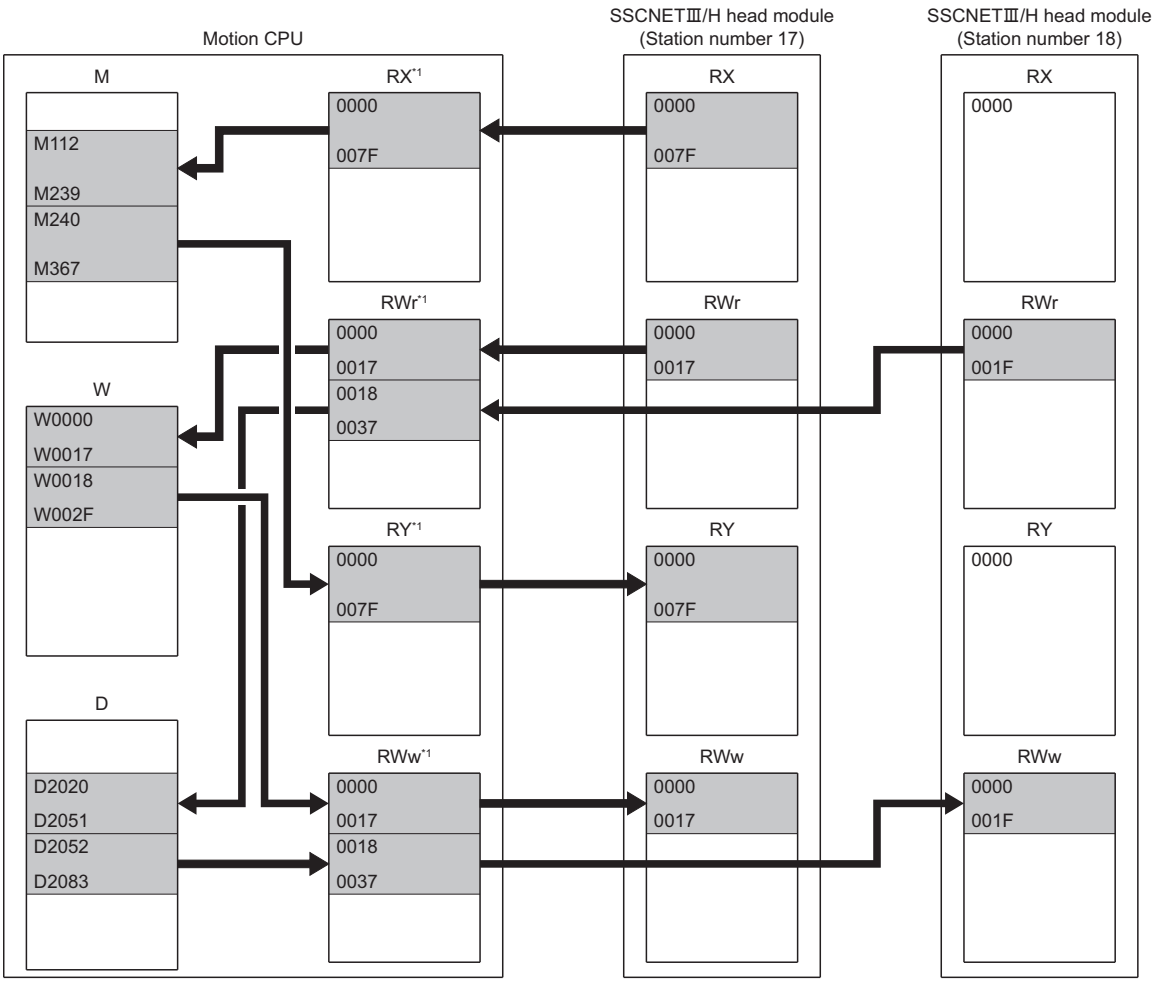
The setting example of parameter is shown below.

Station number	Axis No.	Input/ Output	Link device*1					Refresh device (CPU side)			Status device	Monitor device	Command device
			Device name	Points	Start	End		Points	Start	End			
17	1	Input	RX	128	0000	007F	→	128	M112	M239	M0	D2000	M16
			RWr	24	0000	0017	→	24	W0000	W0017			
		Output	RY	128	0000	007F	←	128	M240	M367			
			RWw	24	0000	0017	←	24	W0018	W002F			
18	2	Input	RX	0			→	0			M32	D2010	M48
			RWr	32	0018	0037	→	32	D2020	D2051			
		Output	RY	0			←	0					
			RWw	32	0018	0037	←	32	D2052	D2083			

*1 Used only for internal processing of Motion CPU. The number of points set in the refresh device (CPU side) is automatically assigned in MT Developer2.

■Operation example

The example of operating parameter is shown below.



*1 Used only for internal processing of Motion CPU. The number of points set in the refresh device (CPU side) is automatically assigned in MT Developer2.

Data operation of intelligent function module by Motion SFC program

In addition to refresh of data by device, data read/write operations to the buffer memory of intelligent function modules on the SSCNETⅢ/H head module can be executed by the RTO and RFROM instructions of Motion SFC programs.

Refer to the following for details.

MELSEC iQ-R Motion controller Programming Manual (Program Design)

Classification	Symbol	Instruction	Description
Others	RTO	Write buffer memory data to head module	Writes word device data to the buffer memory of the intelligent function module mounted to the SSCNETⅢ/H head module.
	RFROM	Read buffer memory data from head module	Reads data from the buffer memory of the intelligent function module mounted to the SSCNETⅢ/H head module, to the word device.

Data of refresh device

The refresh of data by device, for the status of Motion CPU, or when there is a communication failure with the head module are as follows.

	Refresh of data		
	Bit device		Word device
	Input	Output	
At communication failure occurrence	Clear		Maintain
At STOP of Motion CPU	Maintain		
At Motion CPU operation stop error occurrence	Clear		

Precautions when using SSCNETIII/H head module

Disconnect/reconnect function cannot be used for SSCNETⅢ/H head module. If executed it is ignored.

5.6 Compatible Devices with SSCNETIII(/H)

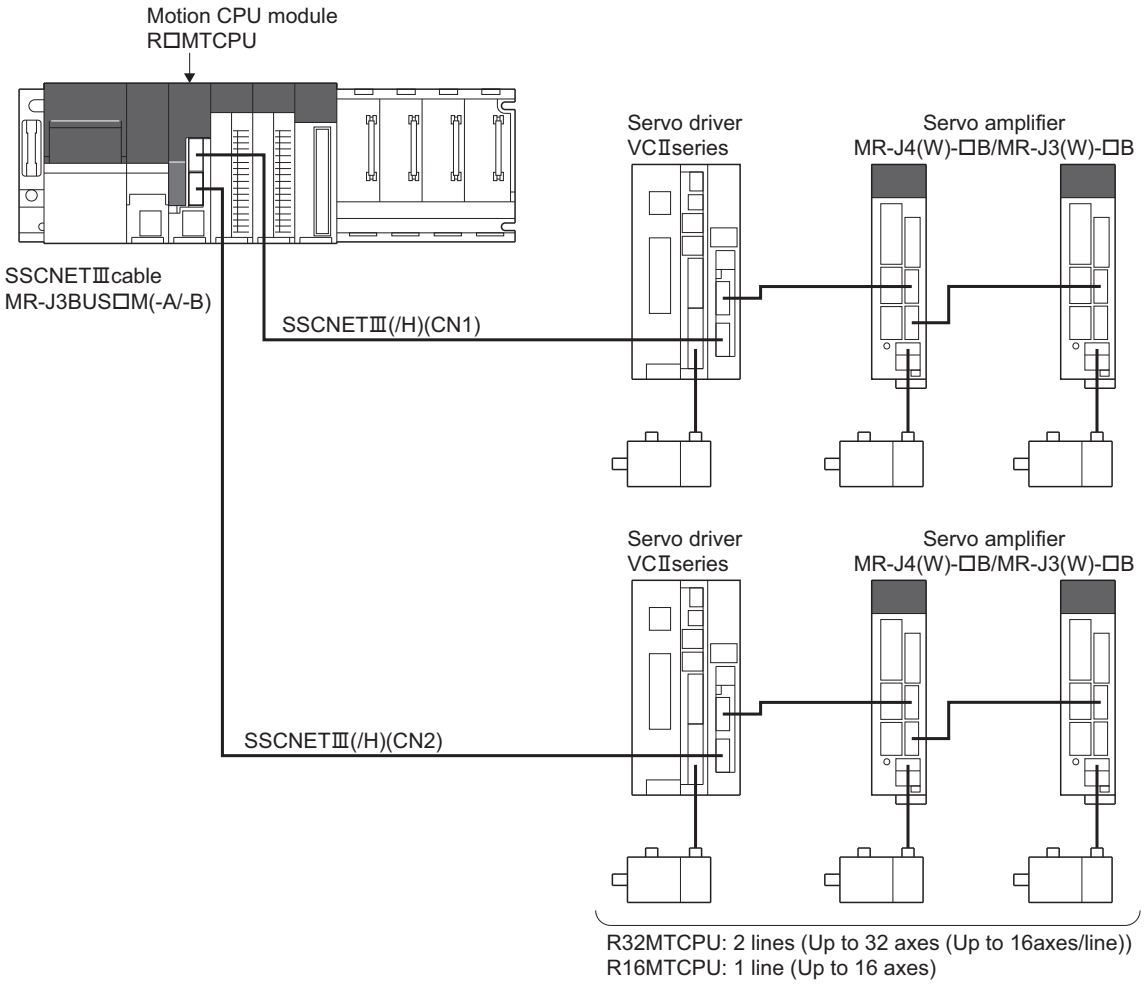
Servo driver VCII series manufactured by Nikki Denso Co., Ltd.

The direct drive τDISC/τiD roll/τServo compass/τLinear stage, etc. manufactured by Nikki Denso Co., Ltd. can be controlled by connecting with the servo driver VCⅡ series manufactured by the same company using the Motion CPU and SSCNETⅢ(/H).

Contact to Nikki Denso overseas sales office for details of VCⅡ series.

System configuration

The system configuration using VCⅡ series is shown below.



Parameter setting

To connect VCⅡ series, set the following in the servo network setting. (☞ Page 56 Servo network setting)

- Set the following for communication type in SSCNET setting.
  - When connecting SSCNETⅢ/H: "SSCNETⅢ/H"
  - When connecting SSCNETⅢ: "SSCNETⅢ"
- Set the amplifier model in amplifier setting to "VCⅡ (Nikki Denso)".

Control of VCII series parameters

Parameters set in VCⅡ series are not controlled by the Motion CPU. They are set directly using VCⅡ data editing software.
For details on setting items for VCⅡ series, refer to the instruction manual of VCⅡ series.

Comparisons of specifications with MR-J4(W)-B/MR-J3(W)-B

Item		VCII series[*1]	MR-J4(W)-□B	MR-J3(W)-□B
Amplifier type		VCⅡ (Nikki Denso)	MR-J4(W)-B(-RJ)	MR-J3(W)-B, MR-J3(W)-B Fully closed, MR-J3(W)-B Linear, MR-J3(W)-B DD motor
Control of servo amplifier parameters		Controlled by VCⅡ series	Controlled by Motion CPU	
External input signal		Not available	External input signals of servo amplifier are available.	
Optional data monitor (Data type)	Registered monitor	• Effective load ratio • Regenerative load ratio • Peak load ratio • Position feed back • Encoder position within one revolution • Encoder multiple revolution counter • Model loop gain • Cumulative current value • Servo command value • Torque command value • Optional address of registered monitor	• Effective load ratio • Regenerative load ratio • Peak load ratio • Position feed back • Encoder position within one revolution • Encoder multiple revolution counter • Load inertia moment ratio • Model loop gain • Main circuit bus voltage • Cumulative current value • Servo motor speed • Selected droop pulse • Module power consumption • Module power consumption (2 words) • Module integral power consumption • Instantaneous torque • Load-side encoder information 1 • Load-side encoder information 2 • Z-phase counter • Servo motor thermistor temperature • Disturbance torque • Overload alarm margin • Error excessive alarm margin • Settling time • Overshoot amount • Servo motor side/load-side position deviation • Servo motor side/load-side speed deviation • Servo command value • Torque command value • Optional address of registered monitor	• Effective load ratio • Regenerative load ratio • Peak load ratio • Position feed back • Encoder position within one revolution • Encoder multiple revolution counter • Load inertia moment ratio • Model loop gain • Main circuit bus voltage • Cumulative current value • Servo motor speed • Selected droop pulse • Load-side encoder information 1 • Load-side encoder information 2 • Motor thermistor temperature • Servo command value • Torque command value • Optional address of registered monitor

Item		VCII series[*1]	MR-J4(W)-□B	MR-J3(W)-□B
Optional data monitor (Data type)	Transient command	• Encoder resolution • Servo amplifier recognition information (First 8 characters) • Servo amplifier recognition information (Last 8 characters) • Servo amplifier software number (First 8 characters) • Servo amplifier software number (Last 8 characters) • Read alarm history number • Alarm history/Detail #1, #2 • Alarm history/Detail #3, #4 • Alarm history/Detail #5, #6 • Alarm history/Detail/Occurrence time • Alarm history clear command • Regenerative load ratio • Effective load ratio • Peak load ratio • Model loop gain • LED display • Optional transient command	• Servo motor ID (SSCNETⅢ)/ Encoder ID • Servo motor ID (SSCNETⅢ/H) • Encoder resolution • Servo amplifier serial number (First 8 characters) • Servo amplifier serial number (Last 8 characters) • Servo amplifier recognition information (First 8 characters) • Servo amplifier recognition information (Last 8 characters) • Servo amplifier software number (First 8 characters) • Servo amplifier software number (Last 8 characters) • Power ON cumulative time • Inrush relay ON/OFF number • Read alarm history number • Alarm history/Detail #1, #2 • Alarm history/Detail #3, #4 • Alarm history/Detail #5, #6 • Alarm history/Detail/Occurrence time • Alarm occurrence time #1, #2 • Alarm occurrence time #3, #4 • Alarm occurrence time #5, #6 • Alarm history/Detail/Occurrence time • Home position [command unit] • Main circuit bus voltage • Regenerative load ratio • Effective load ratio • Peak load ratio • Estimate inertia moment ratio • Model loop gain • LED display • Load-side encoder information 1 • Load-side encoder information 2 • Speed feedback • Servo motor thermistor temperature • Z-phase counter • Module power consumption • Module integral power consumption • Disturbance torque • Instantaneous torque • Overload alarm margin • Error excessive alarm margin • Settling time • Overshoot amount • Servo motor side/load-side position deviation • Servo motor side/load-side speed deviation • Machine diagnostic status • Friction estimation data • Vibration estimation data • Optional transient command	• Servo motor ID (SSCNETⅢ)/ Encoder ID • Encoder resolution • Servo amplifier recognition information (First 8 characters) • Servo amplifier recognition information (Last 8 characters) • Servo amplifier software number (First 8 characters) • Servo amplifier software number (Last 8 characters) • Power ON cumulative time • Inrush relay ON/OFF number • Read alarm history number • Alarm history/Detail #1, #2 • Alarm history/Detail #3, #4 • Alarm history/Detail #5, #6 • Alarm history/Detail/Occurrence time • Alarm occurrence time #1, #2 • Alarm occurrence time #3, #4 • Alarm occurrence time #5, #6 • Alarm history clear command • Home position [command unit] • Main circuit bus voltage • Regenerative load ratio • Effective load ratio • Peak load ratio • Estimate inertia moment ratio • Model loop gain • LED display • Load-side encoder information 1 • Load-side encoder information 2 • Speed feedback • Servo motor thermistor temperature • Optional transient command
Absolute position detection system		Usable[*2]	Usable	
Home position return method		Proximity dog type (1, 2), Count type (1 to 3), Data set type (1), Dog cradle type, Limit switch combined type, Scale home position signal detection type, Dogless home position signal reference type	Proximity dog type (1, 2), Count type (1 to 3), Data set type (1, 2), Dog cradle type, Stopper type (1, 2), Limit switch combined type, Scale home position signal detection type, Dogless home position signal reference type	
Speed-torque control		Position control mode, Speed control mode, Torque control mode	Position control mode, Speed control mode, Torque control mode, Continuous operation to torque control mode	

Item	VCII series*1	MR-J4(W)-□B	MR-J3(W)-□B
Torque limit value change	Usable (Separate setting: Restrictions*3)	Usable	
Gain changing command	Valid	Valid	
PI-PID switching command	Valid	Valid	
Control loop changing command	Invalid	Valid when using servo amplifier for fully closed loop control	
Amplifier-less operation function*4	Usable	Usable	
External input signals of servo amplifier	Unusable	Usable	
Servo parameter read/change	Usable	Usable	
Driver communication	Unusable	Usable*5	
Servo error (Motion error history)	Error codes detected by VCⅡ series are stored	Error codes detected by servo amplifier are stored.	
Programming tool	MR Configurator2 is not available. Use VCⅡ data editing software.	MR Configurator2 is available.	

*1 Confirm the specifications of VCⅡ series for details.

*2 The direct drive τDISC series manufactured by Nikki Denso Co., Ltd. can restore the absolute position in the range from -2147483648 to 2147483647. Confirm the specifications of VCⅡ series for restrictions by the version of VCⅡ series.

*3 The specification of torque limit direction differs by the version of VCⅡ series. Confirm the specifications of VCⅡ series for details.

*4 During amplifier-less operation function, the following are spuriously connected.

	Communication type	
	SSCNETIII/H	SSCNETIII
Servo amplifier	MR-J4-10B	MR-J3-10B
Servo motor	HG-KR053	HF-KP053

*5 Refer to the following for the servo amplifiers that can be used.
Servo amplifier Instruction Manual

Precautions during control

■Home position return

• Home position return operation types

The home position return methods that can be used in VCⅡ series are shown below.

○: Possible, ×: Not possible

Home position return method		Possible/Not possible
Proximity dog type	Proximity dog type 1	○
	Proximity dog type 2	○
Count type	Count type 1	○
	Count type 2	○
	Count type 3	○
Data set type	Data set type 1	○
	Data set type 2	×*1
Dog cradle type		○
Stopper type	Stopper type 1	×*1
	Stopper type 2	×*1
Limit switch combined type		○
Scale home position signal detection type		○
Dogless home position signal reference type		○

*1 Minor error (error code: 1979H) occurs, and home position return is not performed.

- Dogless home position signal reference type
  When performing "dogless home position signal reference type" in VCⅡ series, the home position, home position return operation, and home position return data (home position return retry function, dwell time at the home position return retry) is the following. Also, set the VCⅡ series parameter "Select function for SSCNETⅢ on communicate mode (P612) (Condition selection of home position set)" as follows.

Servo amplifier type		Linear encoder type	Home position	Home position return operation*1	Home position return data		Parameter "Select function for SSCNETIII on communicate mode (P612) (Condition selection of home position set)"
					Home position return retry function	Dwell time at the home position return retry	
VCⅡ series	Linear stage	Absolute position type	Position where address of absolute linear encoder becomes 0	Operation C	Invalid		—
		Incremental type	Reference mark	Operation A	Valid		0
	Direct drive motor	Absolute position type	Home position signal (zero point)	Operation A/ Operation B	Valid/Invalid		0/1
		Incremental type		Operation A	Valid		0

*1 Refer to the following for home position return operation.
MELSEC iQ-R Motion Controller Programming Manual (Positioning Control)

- Home position return without passing motor Z phase
  When "1" is set in the first digit of the parameter of VCⅡ series "Select function for SSCNETⅢ on communicate mode (P612)", it is possible to carry out the home position return without passing the zero point. (Return to home position after power is supplied will be executed when passing of motor Z phase is not necessary.) When "0" is set, a minor error (error code: 197AH) occurs because the home position is executed without passing the motor Z phase (motor reference position signal).

■Control mode

Control modes that can be used are shown below.

- Position control mode (position control, and speed control including position loop)
- Speed control mode (speed control not including position loop)
- Torque control mode (torque control)

However, it is not available to switch to continuous operation to torque control mode of "Speed-torque control". If the mode is switched to continuous operation to torque control mode, a minor error (error code: 19E7H) occurs and the operation stops. "1: Feedback torque" cannot be set in "Torque initial value selection at control mode switching". If it is set, a warning (error code: 0A55H) occurs and the command value immediately after switching is the same as the case of selecting "0: Command torque".

■Control of servo parameters

Parameters of VCⅡ series are not controlled by Motion CPU. Therefore, even though the parameter of VCⅡ series is changed during the communication between Motion CPU and VCⅡ series, it does not process, and is not reflected to the parameter.

■Servo parameter change function

- Change function of servo parameter can be executed.
  The following is the operation for the servo parameter change function.

	Operation for the servo parameter change function
Servo parameter write request	The servo parameter of VCⅡ series is controlled in a unit of 2 words, so that it is necessary to set "3: 2 words write request" in "Servo parameter write/read request (SD804)" for executing the parameter write. If "1: write request" is executed to VCⅡ series, the parameter write fails, and "-1" is stored in "Servo parameter write/read request (SD804)".
Servo parameter read request	The servo parameter of VCⅡ series is controlled in a unit of 2 words, so that it is necessary to set "4: 2 words read request" in "Servo parameter write/read request (SD804)" for executing the parameter read. If "2: read request" is executed to VCⅡ series, the parameter read fails, and "-1" is stored in "Servo parameter write/read request (SD804)".

- When the servo parameter of VCⅡ series is changed by the servo parameter change function, the parameter value after changing the servo parameter cannot be confirmed using VCⅡ data editing software. When confirming the parameter value, execute the servo parameter read request. Also, when the power of VCⅡ series is turned OFF, the parameter changed by the servo parameter change function becomes invalid, and the value written by VCⅡ data editing software becomes valid.
- "Servo parameter write/read" device
  Store the value in the following special registers to change or display the servo parameter.

No.	Name	Meaning	Details	Set by
SD552	Servo parameter write/read request	Servo parameter read value	The read value (low 1 word) of servo parameter which executed "4: 2 word read request" in "Servo parameter write/read request (SD804)" is stored.	System (At reading request)
SD553			The read value (high 1 word) of servo parameter which executed "4: 2 word read request" in "Servo parameter write/read request (SD804)" is stored.	
SD804*1		Servo parameter write/read request flag	• The "write/read request" is executed after setting of the axis No. and servo parameter No. 3: 2 word write request 4: 2 word read request • "0" is automatically set by Motion CPU after completion of servo parameter write/read request. ("-1" is stored by Motion CPU at write/read error.)	User/ System
SD805		Axis No.	The axis No. to write/read servo parameter is stored. R32MTCPU: 1 to 32 R16MTCPU: 1 to 16	User
SD806		Servo parameter No.	The servo parameter No. to be written/read is stored in hexadecimal. H □□□□ Parameter No. Parameter group No. • 0: Group 0 • 5: Group 5 • 1: Group 1 • 6: Group 6 • 2: Group 2 • 7: Group 7 • 3: Group 3 • 8: Group 8 • 4: Group 4 • 9: Group 9	
SD808		Servo parameter setting value (2 word)	The setting value of servo parameter to be written is stored when "3: 2 word write request" is set in "Servo parameter write/read request (SD804)".	
SD809				

*1 Do not execute the automatic refresh.

■Optional data monitor setting

The following table shows data types that can be set.

Set the data so that the total number of communication data points per axis is no more than 6 points in a SSCNETⅢ/H line, and no more than 3 points in a SSCNETⅢ line.

• Registered monitor

Data type[*1]	Unit	Number of words	Number of communication data points
Effective load ratio	[%]	1	1
Regenerative load ratio	[%]	1	1
Peak load ratio	[%]	1	1
Position feedback	[pulse]	2	0
Encoder single revolution position	[pulse]	2	0
Encoder multiple revolution counter	[rev]	1	1
Model loop gain	[rad/s]	1	1
Cumulative current value[*2]	[Positioning command][*3]	2	0
Servo command value[*2*4]	[pulse]	2	0
Torque command value[*2*5]	[0.1%]	1	0
Optional address or registered monitor	—	1	1

*1 Data types other than the above are "0".

*2 The "Cumulative current value", "Servo command value", and "Torque command" are all command values for the servo amplifier. All other data types are servo amplifier monitor values (feedback).

*3 Position commands are in the command unit set at [Motion Control Parameter] → [Axis Setting Parameter] → "Fixed Parameter" → "Unit setting".

*4 The servo amplifier command value is a command value for the servo amplifier. Coordinates differ from those for the Motion CPU, and therefore the result will not be 0 even if the home position is set.

*5 The torque command value is a command value for the servo amplifier. Torque command values are only valid in speed-torque control torque control mode and continuous operation torque control mode. The previous value will remain for the torque command value when restoring to position control from torque control, etc, however, it is not actually used.

• Transient command

Data type	Unit	Number of words[*1]	Number of communication data points	Transient ID	Storage device (response data (+8 to 11)) content
Encoder resolution	[pulse]	2	0	0305h	
Servo amplifier recognition information (First 8 characters)	[characters]	4	0	0310h	
Servo amplifier recognition information (Last 8 characters)	[characters]	4	0	0311h	
Servo amplifier software number (First 8 characters)	[characters]	4	0	0312h	
Servo amplifier software number (Last 8 characters)	[characters]	4	0	0313h	
Read alarm history number	[items]	4	0	0323h	
Alarm history/Detail #1, #2	—	4	0	0324h	+8: Alarm history #1 +9: Alarm detail #1 +10: Alarm history #2 +11: Alarm detail #2
Alarm history/Detail #3, #4	—	4	0	0325h	+8: Alarm history #3 +9: Alarm detail #3 +10: Alarm history #4 +11: Alarm detail #4
Alarm history/Detail #5, #6	—	4	0	0326h	+8: Alarm history #5 +9: Alarm detail #5 +10: Alarm history #6 +11: Alarm detail #6

Data type	Unit	Number of words*1	Number of communication data points	Transient ID	Storage device (response data (+8 to 11)) content
Alarm history/Detail/Occurrence time	—/[h]	4	0	0328h	+8: Alarm history number #(N+1) +9: Alarm history number #(N+1) detail +10: Alarm history number #(N+1) occurrence time (2 words)
Alarm history clear command	—	1	0	0382h	
Regenerative load ratio	[%]	1	0	040Bh	
Effective load ratio	[%]	1	0	040Ch	
Peak load ratio	[%]	1	0	040Dh	
Model loop gain	[rad/s]	1	0	040Fh	
LED display	[characters]	2	0	0410h	+8: Lower 2 digits +9: Higher 2 digits
Optional transient command	—	4	0	—	

*1 Number of words for response data (+8 to 11)

■Gain changing command, PI-PID switching command, control loop changing command

Gain changing command and PI-PID switching command are available. Control loop changing command becomes invalid.

■Driver communication

The driver communication is not supported. If the driver communication is set in a servo parameter, a minor error (error code: 1C93H) will occur when the power of Multiple CPU system is turned ON.

■Monitor devices (#8000 to #8639)

This register stores the servo amplifier types and servo amplifier vendor ID below when using VCⅡ series.

• [Md.1014] Servo amplifier type (#8000+20n)

Type code	Details
258(0102h)	VCⅡ series (For linear stage) *1 (Nikki Denso Co., Ltd. make)
263(0107h)	VCⅡ series (For direct drive motor) *1 (Nikki Denso Co., Ltd. make)
4096(1000h)	VCⅡ series *2 (Nikki Denso Co., Ltd. make)

*1 When connecting SSCNETⅢ/H
*2 When connecting SSCNETⅢ

• [Md.1027] Servo amplifier Vendor ID (#8016+20n)

Vendor ID code	Details
8	Nikki Denso Co., Ltd.

■Operation cycle

If "SSCNETⅢ" is set as the SSCNET settings communication type, the operation cycle of 0.222[ms] cannot be used. Furthermore, even if the operation cycle is set to 0.222[ms] in the setting for axes 1 to 4 for 1 system, if the servo amplifier is mixed with the VCⅡ series, the servo amplifier operates with an operation cycle of 0.444[ms]. If "SSCNETⅢ/H" is set as the SSCNET settings communication type, there are no restrictions.

VCII series detection error

When an error occurs on VCⅡ series, the "[St.1068] Servo error detection (M2408+20n)" turns ON. Eliminate the error cause, reset the servo amplifier error by turning ON "[Rq.1148] Servo error reset command (M3208+20n)" and perform re-start. However, "0" is always stored in "[Md.107] Parameter error No. (#8009+20n)". The errors detected by VCⅡ series are shown in the table below. Refer to the instruction manual of VCⅡ series for details of the errors.

■VCII series

Error code	VCII series LED display	Name	Remarks
1H	1-0	IPM error	
3H	1-3	Excessive voltage error	
5H	3-0	Encoder-related error	
6H	1-4	Over speed error	
7H	1-5	Overload error	
8H	F-0	Overload precaution	
9H	1-8	AC-off detection error	
AH	3-1	At-power-ON motor shaft error	
DH	4-0	Deviation over flow	
EH	4-1	Deviation error	
FH	F-1	Deviation abnormal warning	
11H	5-0	Forward over travel	
12H	5-1	Reverse over travel	
13H	5-2	Forward software over travel	
14H	5-3	Reverse software over travel	
19H	E-0	Absolute encoder battery error	
1AH	F-4	Absolute encoder battery error warning	
1BH	3-2	Serial encoder count error	
1CH	E-2	Absolute encoder over flow error	
1DH	E-3	Absolute encoder count error	
1EH	3-3	Serial encoder/IPU communication error	
20H	2-0	Motor type none-setup	
21H	2-1	Motor type incompatible	
22H	A-1	EEPROM (Nonvolatile memory) writing error	
23H	A-2	Rated speed command Invalid 1	
24H	A-3	Rated speed command Invalid 2	
25H	1-2	Main power supply shortage error	
28H	1-6	IPM overload error	
29H	1-7	Regenerative resistor overload error	
2AH	F-3	Zero return incomplete automatic startup warning	
2BH	6-0	Address setting error	
2CH	6-1	Positioning timeover	
2DH	6-d	Successive control command invalid	
2EH	E-1	Absolute encoder backup error	
2FH	6-2	Positioning data over flow	
30H	6-3	1-rotation data no-setting	
31H	1-A	Servo control error	
32H	6-4	Program end command non-setup	
33H	6-5	Sub-routine call nesting over	
34H	9-4	Receive error 1	
35H	1-C	Command frequency error	
36H	9-5	Receive error 2	
37H	6-9	Division invalid	
38H	6-A	Positioning volume error	
3AH	6-b	Invalid command	

Error code	VCII series LED display	Name	Remarks
3BH	6-C	Indirect data No. invalid	
3CH	7	Data sustain error 1	
3DH	7	Data sustain error 2	
3EH	7	Data sustain error 3	
3FH	7	Data sustain error 4	
40H	7	Data sustain error 5	
41H	7	Data sustain error 6	
42H	7	Data sustain error 7	
43H	7	Data sustain error 8	
44H	7	Data sustain error 9	
45H	7	Data sustain error 10	
46H	7	Data sustain error 11	
47H	7	Data sustain error 12	
48H	7	Data sustain error 13	
49H	7	Data sustain error 14	
4AH	7	Data sustain error 15	
4BH	7	Data sustain error 16	
4CH	7	Data sustain error 17	
4DH	7	Data sustain error 18	
4EH	7	Data sustain error 19	
4FH	7	Data sustain error 20	
50H	7	Data sustain error 21	
51H	7	Data sustain error 22	
52H	7	Data sustain error 23	
53H	7	Data sustain error 24	
54H	7	Data sustain error 25	
55H	7	Data sustain error 26	
56H	7	Data sustain error 27	
57H	7	Data sustain error 28	
58H	7	Data sustain error 29	
59H	7	Data sustain error 30	
5AH	7	Data sustain error 31	
5BH	7	Data sustain error 32	
5CH	7	Data sustain error 33	
5DH	7	Data sustain error 34	
5EH	7	Data sustain error 35	
5FH	7	Data sustain error 36	
60H	7	Data sustain error 37	
62H	7	Data sustain error 39	
63H	7	Data sustain error 40	
64H	7	Data sustain error 41	
66H	7	Data sustain error 43	
67H	7	Data sustain error 44	
6CH	A-7	Rated speed command Invalid 3	
6DH	1-b	Input power supply error	
6EH	—	FLASH (Nonvolatile memory) writing error	
6FH	9-3	Remote sequence control receive timeout	
70H	F-5	Remote sequence control communication stand-by warning	
71H	9-1	Remote sequence control IC defect	
72H	9-2	Remote sequence control communication-OFF	
73H	A-4	Servo control communication disconnection error	
75H	A-5	Servo control communication error	
76H	F-2	Main power supply low voltage detection warning	

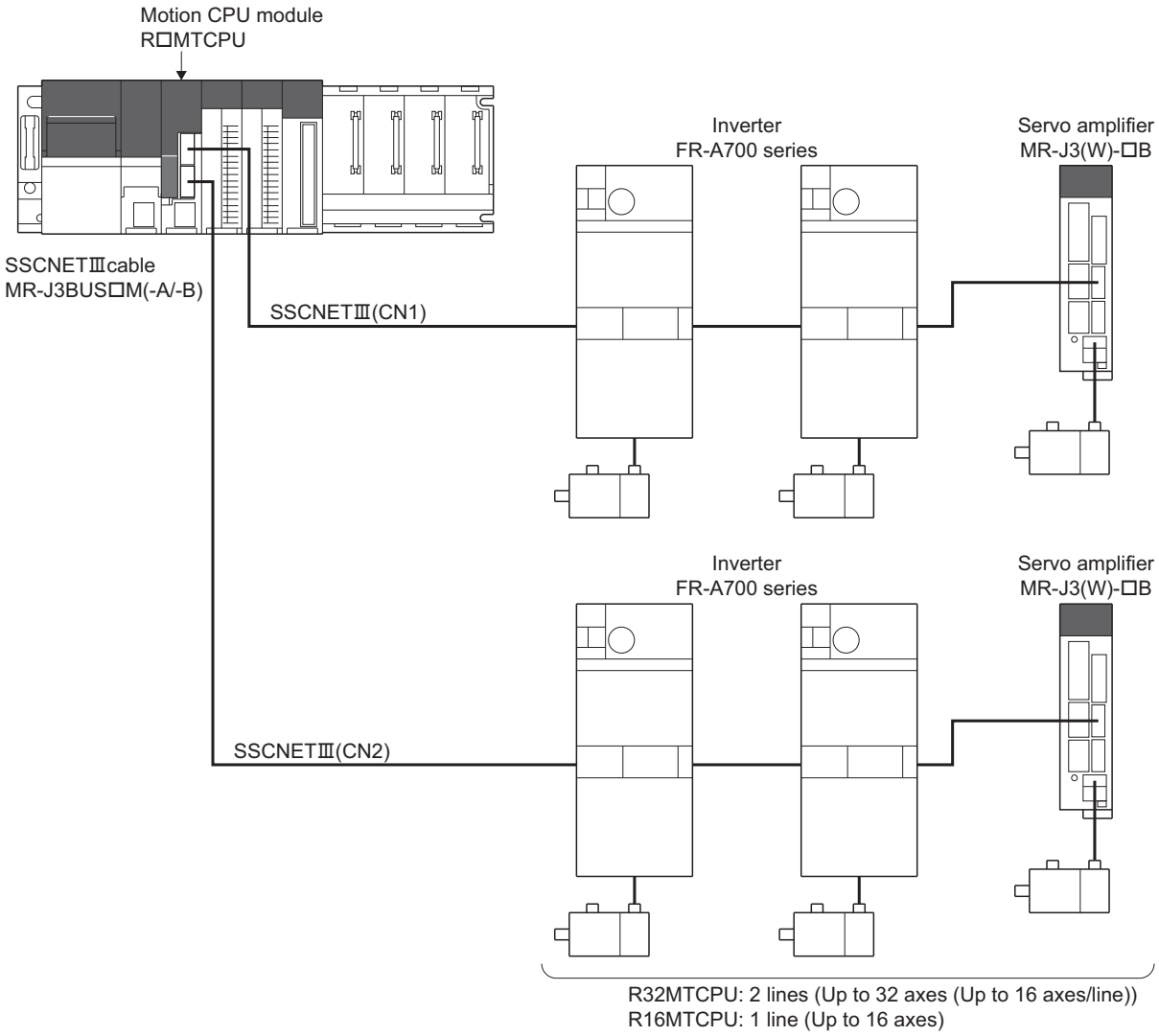
Error code	VCII series LED display	Name	Remarks
77H	3-4	Linear sensor resolution error	
78H	6-0	Free curve motion data error	
79H	6-1	Standard position return data error	
7AH	6-2	Slave axis movement error	
7CH	F-6	Remote sequence control SW change warning	
82H	3-5	IPU error	
83H	3-6	Serial number check error	
84H	3-7	Serial number none-setup (Empty)	
87H	3-8	τDISC motor 1-rotation position detection speed error	
88H	3-9	τDISC absolute encoder light-receiving element error	
89H	3-A	τDISC absolute encoder light-emitting element error	
8BH	3-b	Magnetic pole detection error	
AAH	E-5	Over speed	
ABH	E-6	Initialization error	
ACH	E-7	Hardware error	
ADH	E-8	Absolute data error	
AEH	E-9	Transducer error	
AFH	E-A	Signal strength error	
B0H	F-b	Signal strength warning	
B1H	F-C	Thermal warning	
BEH	E-5	Encoder and IPU communication error	
BEH	E-6	Encoder and IPU cable disconnection	
C0H	E-7	Encoder backup error	
C1H	E-8	IPU backup error	
C2H	F-b	Encoder position sensing part deterioration warning	
E6H	F-7	Driver emergency stop	
E7H	F-8	Controller emergency stop	
1C82H	—	Internal circuit fault	

Inverter FR-A700 series

FR-A700 series can be connected via SSCNETⅢ by using built-in option FR-A7AP and FR-A7NS.

System configuration

The system configuration using FR-A700 series is shown below.



Parameter setting

To connect FR-A700 series, set the following in the servo network setting. (☞ Page 56 Servo network setting)

- Set "SSCNETⅢ" for communication type in SSCNET setting.
- Set the amplifier model in amplifier setting to "FR-A700".

Control of FR-A700 series parameters

Parameters set in FR-A700 series are not controlled by Motion CPU. Set the parameters by connecting FR-A700 series directly with the operation panel on the front of inverter (FR-DU07/FR-PU07) or FR Configurator that is inverter setup software. For details on setting items for FR-A700 series, refer to the instruction manual of the FR-A700 series.

Point

In the state of connecting between FR-A700 series and Motion CPU, only a part of parameters can be set if the parameter of the inverter " Pr.77 Parameter write selection" is in the initial state. Set "2: Write parameters during operation" to rewrite the parameters of FR-A700 series.

Reset selection/disconnected PU detection/PU stop selection

When PU stop is executed in FR-A700 series, position error excessive, etc. occur because a command from Motion CPU does not stop. Set "0 to 3" in the parameter of the inverter " Pr.75 Reset selection/disconnected PU detection/PU stop selection". To stop FR-A700 series, use the stop signal and the forced stop of Motion CPU, or use the output stop (MRS) of FR-A700 series.

Setting item	Default value	Setting value	Details
Reset selection/ disconnected PU detection/PU stop selection (Pr. 75)	14	0	• Reset input is always enabled. • If the PU is disconnected, operation will be continued. • PU stop is disabled at SSCNETⅢ connection.
		1	• A reset can be input only when the protective function is activated. • If the PU is disconnected, operation will be continued. • PU stop is disabled at SSCNETⅢ connection.
		2	• Reset input is always enabled. • When the PU is disconnected, the inverter trips. • PU stop is disabled at SSCNETⅢ connection.
		3	• A reset can be input only when the protective function is activated. • When the PU is disconnected, the inverter trips. • PU stop is disabled at SSCNETⅢ connection.
		14	• Reset input is always enabled. • If the PU is disconnected, operation will be continued. • Deceleration stop by PU stop in any operation mode.
		15	• A reset can be input only when the protective function is activated. • If the PU is disconnected, operation will be continued. • Deceleration stop by PU stop in any operation mode.
		16	• Reset input is always enabled. • When the PU is disconnected, the inverter trips. • Deceleration stop by PU stop in any operation mode.
		17	• A reset can be input only when the protective function is activated. • When the PU is disconnected, the inverter trips. • Deceleration stop by PU stop in any operation mode.

*1 Note that the default value is set to "14". (Change the value to "0 to 3")

In-position range

Set the in-position range in the parameter of the inverter "In-position width (Pr. 426)". When the position of the cam axis is restored in advanced synchronous control, a check is performed by the servo parameter "In-position range"(PA10). However, because the servo parameter settings are not performed in FR-A700, the "In-position range" is checked as 100[pulse] (fixed value).

Optional data monitor setting

The following table shows data types that can be set.

Set the data so that the total number of communication data points per axis is no more than 3 points.

■Registered monitor

Data type	Unit	Number of words	Number of communication data points
Motor load factor	[%]	1	1
Position feedback	[pulse]	2	0
Encoder single revolution position	[pulse]	2	0
Encoder multiple revolution counter	[rev]	1	1
Load inertia moment ratio	[× 0.1 times]	1	1
Position loop gain	[rad/s]	1	1
Converter output voltage	[V]	1	1
Cumulative current value*1	[Positioning command]*2	2	0
Torque command value*1*3	[0.1 %]	1	0
Optional address of registered monitor	—	1	1

*1 The "Cumulative current value", "Servo command value", and "Torque command" are all command values for the servo amplifier. All other data types are servo amplifier monitor values (feedback).

*2 Position commands are in the command unit set in the servo data settings.

*3 The torque command value is a command value for the servo amplifier. Torque command values are only valid in speed-torque control torque control mode and continuous operation torque control mode. The previous value will remain for the torque command value when restoring to position control from torque control, etc., however, it is not actually used.

■Transient command

Data type	Unit	Number of words*1	Number of communication data points	Transient ID	Storage device (response data (+8 to 11)) content
Servo amplifier recognition information (First 8 characters)	[characters]	4	0	0310h	
Servo amplifier recognition information (Last 8 characters)	[characters]	4	0	0311h	
Servo amplifier software number (First 8 characters)	[characters]	4	0	0312h	
Servo amplifier software number (Last 8 characters)	[characters]	4	0	0313h	
Read alarm history number	[items]	4	0	0323h	
Alarm history/Detail #1, #2	—	4	0	0324h	+8: Alarm history #1 +9: Alarm detail #1 +10: Alarm history #2 +11: Alarm detail #2
Alarm history/Detail #3, #4	—	4	0	0325h	+8: Alarm history #3 +9: Alarm detail #3 +10: Alarm history #4 +11: Alarm detail #4
Alarm history/Detail #5, #6	—	4	0	0326h	+8: Alarm history #5 +9: Alarm detail #5 +10: Alarm history #6 +11: Alarm detail #6
Alarm history/Detail #7, #8	—	4	0	0327h	+8: Alarm history #7 +9: Alarm detail #7 +10: Alarm history #8 +11: Alarm detail #8
Alarm history occurrence time #1, #2	[h]	4	0	0329h	+8: Alarm occurrence time #1 (2 words) +10: Alarm occurrence time #2 (2 words)

Data type	Unit	Number of words*1	Number of communication data points	Transient ID	Storage device (response data (+8 to 11)) content
Alarm history occurrence time #3, #4	[h]	4	0	032Ah	+8: Alarm occurrence time #3 (2 words) +10: Alarm occurrence time #4 (2 words)
Alarm history occurrence time #5, #6	[h]	4	0	032Bh	+8: Alarm occurrence time #5 (2 words) +10: Alarm occurrence time #6 (2 words)
Alarm history occurrence time #7, #8	[h]	4	0	032Ch	+8: Alarm occurrence time #7 (2 words) +10: Alarm occurrence time #8 (2 words)
Alarm history clear command	—	1	0	0382h	
Main circuit bus voltage	[V]	1	0	040Ah	
Effective load ratio	[%]	1	0	040Ch	
Estimate inertia moment ratio	[× 0.1]	1	0	040Eh	
Model loop gain	[rad/s]	1	0	040Fh	
LED display	[characters]	2	0	0410h	+8: Lower 2 digits +9: Higher 2 digits
Optional transient command	—	4	0	—	

*1 Number of words for response data (+8 to 11)

Point

When FR-A700 series is used, each data is delayed for "update delay time + communication cycle" because of the update cycle of the inverter. The update delay time for each data is shown in the table below.

Data type	Update delay time of FR-A700 series
Motor load factor	12.5ms
Position feedback	222μs
Encoder single revolution position	222μs
Absolute position encoder multiple revolution counter	222μs
Load inertia moment ratio	56ms or more (up to 2500ms)
Position loop gain	56ms or more (up to 2500ms)
Converter output voltage	9.888ms

External input signal

Set as the following to fetch the external input signal (FLS/RLS/DOG) via FR-A700 series.

■Setting in MT Developer2

Set "Amplifier input" for every axis with signal type in the external signal parameter of axis setting parameter.

■Parameter settings on the inverter side

Set the parameters of the inverter as follows. (Otherwise, each signal remains OFF.)

Setting item	Default value	Setting value	Details
STF terminal function selection (Pr. 178)	60	60	Use with the default value
STR terminal function selection (Pr. 179)	61	61	
JOG terminal function selection (Pr. 185)	5	76	Set 76 (Proximity dog)
SSCNETⅢ input filter selection (Pr. 449)	4	0: None 1: 0.88ms 2: 1.77ms 3: 2.66ms 4: 3.55ms	Set the input filter setting value at reading an external signal.

Comparisons of specifications with MR-J3(W)-B

Item		FR-A700 series[*1]	MR-J3(W)-□B
Amplifier type		FR-A700	MR-J3(W)-B, MR-J3(W)-B Fully closed, MR-J3(W)-B Linear, MR-J3(W)-B DD motor
Control of servo amplifier parameters		Set directly by inverter. (Not controlled by Motion CPU.)	Controlled by Motion CPU.
External input signal		External input signals of FR-A700 series are available.	External input signals of servo amplifier are available.
Optional data monitor (Data type)	Registered monitor	• Motor load factor • Position feedback • Encoder position within one revolution • Encoder multiple revolution counter • Load inertia moment ratio • Position loop gain • Converter output voltage • Cumulative current value • Torque command value • Optional address of registered monitor	• Effective load ratio • Regenerative load ratio • Peak load ratio • Position feed back • Encoder position within one revolution • Encoder multiple revolution counter • Load inertia moment ratio • Position loop gain 1 • Main circuit bus voltage • Cumulative current value • Servo motor speed • Selected droop pulse • Load-side encoder information 1 • Load-side encoder information 2 • Motor thermistor temperature • Servo command value • Torque command value • Optional address of registered monitor
	Transient command	• Servo amplifier recognition information (First 8 characters) • Servo amplifier recognition information (Last 8 characters) • Servo amplifier software number (First 8 characters) • Servo amplifier software number (Last 8 characters) • Read alarm history number • Alarm history/Detail #1, #2 • Alarm history/Detail #3, #4 • Alarm history/Detail #5, #6 • Alarm history/Detail #7, #8 • Alarm history occurrence time #1, #2 • Alarm history occurrence time #3, #4 • Alarm history occurrence time #5, #6 • Alarm history occurrence time #7, #8 • Alarm history clear command • Main circuit bus voltage • Effective load ratio • Estimate inertia moment ratio • Model loop gain • LED display • Optional transient command	• Servo motor ID (SSCNETⅢ)/Encoder ID • Encoder resolution • Servo amplifier recognition information (First 8 characters) • Servo amplifier recognition information (Last 8 characters) • Servo amplifier software number (First 8 characters) • Servo amplifier software number (Last 8 characters) • Power ON cumulative time • Inrush relay ON/OFF number • Read alarm history number • Alarm history/Detail #1, #2 • Alarm history/Detail #3, #4 • Alarm history/Detail #5, #6 • Alarm history/Detail/Occurrence time • Alarm occurrence time #1, #2 • Alarm occurrence time #3, #4 • Alarm occurrence time #5, #6 • Alarm history clear command • Home position [command unit] • Main circuit bus voltage • Regenerative load ratio • Effective load ratio • Peak load ratio • Estimate inertia moment ratio • Model loop gain • LED display • Load-side encoder information 1 • Load-side encoder information 2 • Speed feedback • Servo motor thermistor temperature • Optional transient command
Absolute position detection system		Unusable	Usable
Home position return method		Proximity dog type (1, 2), Count type (1 to 3), Data set type (1), Dog cradle type, Limit switch combined type, Scale home position signal detection type	Proximity dog type (1, 2), Count type (1 to 3), Data set type (1, 2), Dog cradle type, Stopper type (1, 2), Limit switch combined type, Scale home position signal detection type, Dogless home position signal reference type
Speed-torque control		Position control mode, Speed control mode, Torque control mode	Position control mode, Speed control mode, Torque control mode, Continuous operation to torque control mode
Gain changing command		Valid	Valid
PI-PID switching command		Valid	Valid

Item	FR-A700 series*1	MR-J3(W)-□B
Control loop changing command	Invalid	Valid when using servo amplifier for fully closed loop control (MR-J3-□B-RJ006)
Servo parameter read/write	Unusable	Usable
Amplifier-less operation function*2	Usable*3	Usable
Driver communication	Unusable	Usable*4
Monitoring of servo parameter error No.	Unusable	Usable
Servo error (Motion error history)	Error codes detected by FR-A700 series are stored.	Error codes detected by servo amplifier are stored.
Programming tool	MR Configurator2 is not available. Use FR-DU07/FR-PU07, or FR Configurator.	MR Configurator2 is available.

*1 For details of FR-A700 series, refer to FR-A700 series instruction manual.

*2 During amplifier-less operation function, the following are spuriously connected.
·Servo amplifier: MR-J3-10B
·Servo motor: HF-KP053

*3 Parameters set in FR-A700 series are not controlled by Motion CPU. Therefore, the operation is the same as when the servo parameter "Rotation direction selection/travel direction selection (PA14)" is set as below during amplifier-less operation mode.

Setting item	Setting value	Details
Rotation direction selection/travel direction selection (PA14)	0	Positioning address increase: CCW or positive direction
		Positioning address decrease: CW of negative direction

*4 Refer to the "Servo Amplifier Instruction Manual" for the servo amplifiers that can be used.

Precautions during control

■Absolute position system (ABS)/Incremental system (INC)

When using FR-A700 series, absolute position system (ABS) cannot be used.

■Control mode

Control modes that can be used are shown below.

- Position control mode (position control, and speed control including position loop)
- Speed control mode (speed control not including position loop)
- Torque control mode (torque control)

However, it is not available to switch to continuous operation to torque control mode of "Speed-torque control". If the mode is switched to continuous operation to torque control mode, a minor error (error code: 19E7H) occurs and the operation stops. "1: Feedback torque" cannot be set in "Torque initial value selection at control mode switching". If it is set, a warning (error code: 0A55H) occurs and the command value immediately after switching is the same as the case of selecting "0: Command torque".

■Control mode switching of speed-torque control

The axis connected with FR-A700 series takes more time to switch the control mode than the axis connected with the servo amplifier.

Switching operation	Switching time at the servo amplifier use	Switching time at FR-A700 series use
Position control mode → Speed control mode	6 to 11ms	19 to 24ms
Speed control mode → Position control mode		
Position control mode → Torque control mode		
Torque control mode → Position control mode		
Speed control mode → Torque control mode		
Torque control mode → Speed control mode		

■Driver communication

The driver communication is not supported. If the driver communication is set in a servo parameter, a minor error (error code: 1C93H) will occur when the power supply of the Multiple CPU system is turned ON.

■Monitor devices (#8000 to #8639)

This register stores the servo amplifier types and servo amplifier vendor ID below when using FR-A700 series.

- [Md.1014] Servo amplifier type (#8000+20n)

Type code	Details
16640(4100H)	FR-A700 series (Inverter)
16641(4101H)	FR-A700-NA series (Inverter)
16642(4102H)	FR-A700-EC series (Inverter)
16643(4103H)	FR-A700-CHT series (Inverter)

- [Md.1027] Servo amplifier Vendor ID (#8016+20n)

Vendor ID code	Details
0	Mitsubishi Electric Corporation

■Operation cycle

If "SSCNETⅢ" is set as the SSCNET settings communication type, the operation cycle of 0.222[ms] cannot be used. Furthermore, even if the operation cycle is set to 0.222[ms] in the setting for axes 1 to 4 for 1 system, if the servo amplifier is mixed with the FR-A700 series, the servo amplifier operates with an operation cycle of 0.444[ms].

FR-A700 series detection error

When an error occurs on FR-A700 series, the "[St.1068] Servo error detection (M2408+20n)" turns ON. Eliminate the error cause, reset the servo amplifier error by turning ON "[Rq.1148] Servo error reset command (M3208+20n)" and perform re-start. However, "0" is always stored in "[Md.107] Parameter error No. (#8009+20n)", and "Absolute position lost (b14)" of "[Md.108] Servo status 1 (#8010+20n)". The errors detected by FR-A700 series are shown in the table below.
Refer to the instruction manual of FR-A700 series for details of the errors.

■FR-A700 series

Error code	FR-A700 series LED display	Name	Remarks
10H	E.OC1	Overcurrent trip during acceleration	
11H	E.OC2	Overcurrent trip during constant speed	
12H	E.OC3	Overcurrent trip during deceleration or stop	
15H	E.OV3	Regenerative overvoltage trip during deceleration or stop	
16H	E.THM	Motor overload trip (electronic thermal relay function)	
17H	E.THT	Inverter overload trip (electronic thermal relay function)	
18H	E.IPF	Instantaneous power failure	
19H	E.UVT	Undervoltage	
20H	E.BE	Brake transistor alarm detection	
21H	E.GF	Output side earth (ground) fault overcurrent	
22H	E.OHT	External thermal relay operation	
23H	E.OLT	Stall prevention stop	
24H	E.OPT	Option fault	
27H	E.PE	Parameter storage device fault	
28H	E.PUE	PU disconnection	
30H	E.CPU	CPU fault	
31H	E.ILF	Input phase loss	
32H	E.FIN	Heatsink overheat	
33H	E.OS	Overspeed occurrence	
34H	E.OSD	Speed deviation excess detection	
35H	E.ECT	Signal loss detection	
36H	E.OD	Excessive position fault	
45H	E.P24	24VDC power output short circuit	
46H	E.CTE	Operation panel power supply short circuit, RS-485 terminal power supply short circuit	
47H	E.LF	Output phase loss	
48H	E.PTC	PTC thermistor operation	
49H	E.PE2	Parameter storage device fault	
50H	E.CDO	Output current detection value exceeded	
51H	E.IOH	Inrush current limit circuit fault	
52H	E.SER	Communication fault (inverter)	
53H	E.AIE	Analog input fault	
54H	E.USB	USB communication fault	
56H	E.1	Option fault	
57H	E.2		
58H	E.3		
61H	E.6	CPU fault	
62H	E.7		
70H	E.EP	Encoder phase fault	
90H	E.OP3	Communication option fault	
91H	E.OP3		
92H	E.OP3		
F0H	OL	Stall prevention (overcurrent)	
F1H	oL	Stall prevention (overvoltage)	

Error code	FR-A700 series LED display	Name	Remarks
F2H	PS	PU stop	
F3H	RB	Regenerative brake pre-alarm	
F4H	TH	Electronic thermal relay function pre-alarm	
F5H	MT	Maintenance signal output	
F6H	CP	Parameter copy	
F7H	SL	Speed limit indication (Output during speed limit)	
F8H	Fn	Fan alarm	
E4H	—	Parameter write error	
E6H	—	Output stop	
E7H	—	Emergency stop	

Optical hub unit

The SSCNETⅢ/H Compatible Optical Hub Unit (MR-MV200) is a unit that enables the branching of SSCNETⅢ/H communication on 1 line (3 branches for 1 input). SSCNETⅢ/H communication can be branched by installing an optical hub unit in a SSCNETⅢ/H system.
The optical hub unit is compatible with all slave equipment (servo amplifiers etc.) that supports SSCNETⅢ/H communication. Setting the optical hub unit station settings on Motion CPUs and MT Developer2 is not required.
The power supply of equipment connected to the optical hub unit can be turned OFF/ON (Disconnect/Reconnect) during operation.

Restrictions on SSCNET communication

Set the communication type to "SSCNETⅢ/H" for the SSCNET setting connecting the optical hub unit.
SSCNETⅢ/H communication equipment set in MT Developer2 can be connected. There are no restrictions on connection order or connection position.
The servo amplifiers and SSCNETⅢ/H compatible equipment that can be used with the optical hub unit are shown below.
○: Available, ×: Not available

SSCNET setting	Servo amplifier		SSCNETIII/H compatible equipment
	MR-J4(W)-□B	MR-J3(W)-□B	
SSCNETⅢ/H	○	×	○
SSCNETⅢ	×	×	×

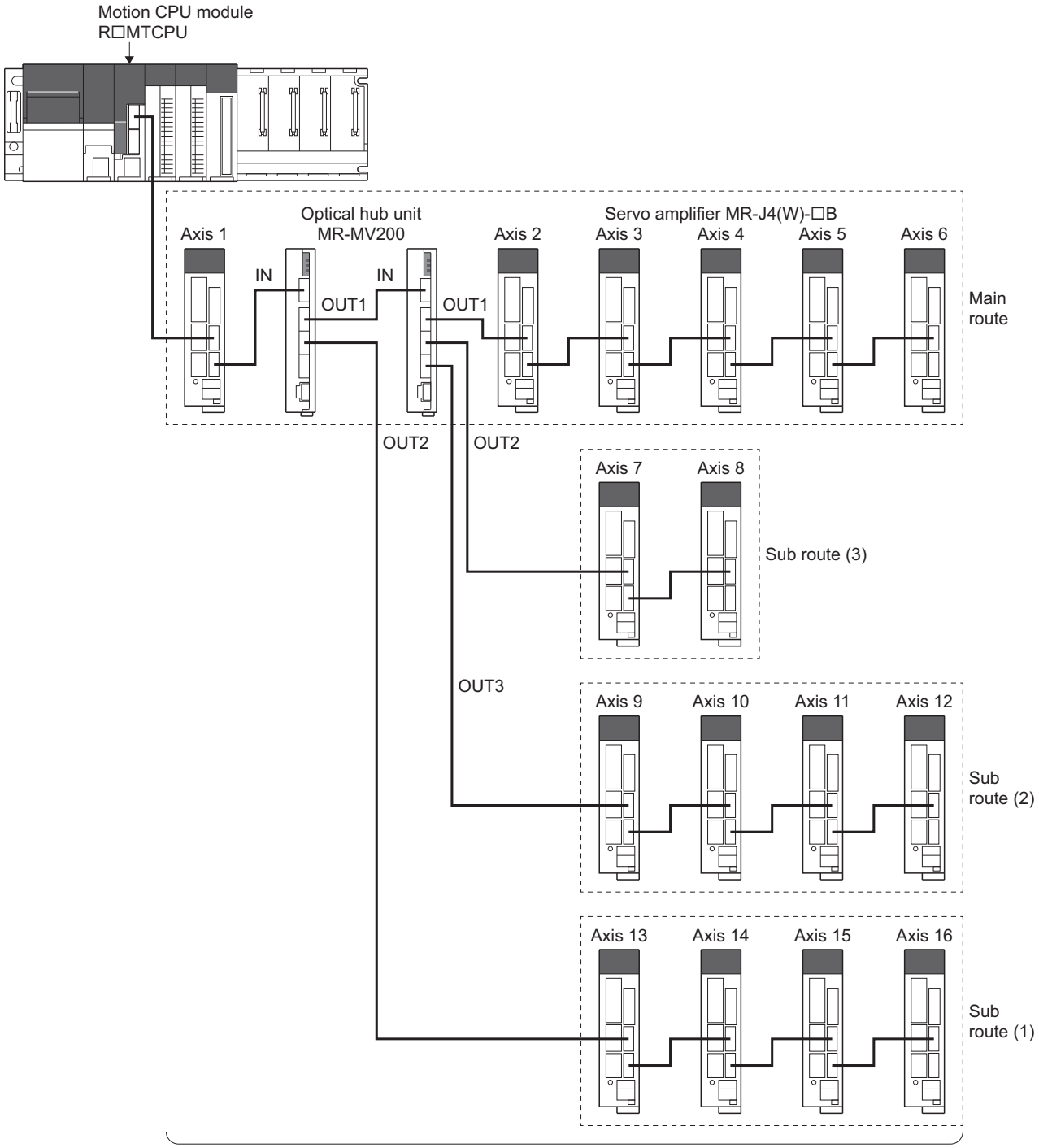
System configuration

A connection example using optical hub units is shown below.

The transmission route that passes through the optical hub unit IN connector (CN1A connector for servo amplifier) and OUT1 connector (CN1B connector for servo amplifier) is called the "Main route", and the transmission routes that pass through OUT2 connector and OUT3 connectors are called the "Sub route".

The optical hub unit can only be connected on the main route.

Also, the optical hub unit is not included in the number of connected modules on a line.



R32MTCPU: 2 lines (Up to 32 axes (up to 16 axes per line))
R16MTCPU: 1 line (Up to 16 axes)
*: The optical hub unit is not included in the count

Point

- If the optical hub unit is connected to a sub route, an error occurs, and the optical hub unit does not communicate with the Motion CPU.
- A servo amplifier can be connected between two optical hub units, and between a Motion CPU and an optical hub unit.
- When turning OFF the control circuit power supply of SSCNETⅢ/H compatible equipment connected to an optical hub unit, use the "connect/disconnect function of SSCNET communication". Refer to connect/disconnect function of SSCNET communication for details of "connect/disconnect function of SSCNET communication". (☞ Page 130 Connect/disconnect function of SSCNET communication)

Checking the status of the optical hub unit

The connection status of the optical hub unit can be checked with the special registers below.

Device No.	Name	Meaning	Details	Set by
SD504	SSCNETⅢ/H compatible optical hub unit loading information (line 1)	SSCNETⅢ/H compatible optical hub unit loading information (line 1)	• Checks the connection status (Installed: 1/Not installed: 0) of the optical hub unit and stores as bit data. SD504: b0 to b15 (Optical hub unit No. 1 to No. 16 on the first line) SD506: b0 to b15 (Optical hub unit No. 1 to No. 16 on the second line) *: No. 1 to No. 16 is the connection order from the Motion CPU • "1" is stored to the installation status of an optical hub unit with a servo amplifier connected. • "0" is stored to the installation status when an optical hub unit is not connected after an optical hub unit that is not connected to a servo amplifier, or when the optical hub unit connected after an optical hub unit is not connected to a servo amplifier either. • For optical hub units connected before an optical hub unit connected to a servo amplifier, "1" is stored to the installation status, regardless of whether there is a servo amplifier connection or not.	System (Operation cycle)
SD506	SSCNETⅢ/H compatible optical hub unit loading information (line 2)	SSCNETⅢ/H compatible optical hub unit loading information (line 2)		

Driver communication function

Driver communication function is only supported between servo amplifiers on the same route starting from the Motion CPU until the last module.

Driver communication is not performed between servo amplifiers on different sub routes, or between a servo amplifier connected on the main route after an optical hub unit and a servo amplifier on a sub route connected to an optical hub unit.When an axis set for driver communication is in a position where driver communication cannot be performed, or when the connection of an axis set for driver communication is not confirmed, all servo amplifiers including those that are on axes not set to driver communication, cannot communicate with the Motion CPU.

Routes where driver communication function is possible are shown below.

○: Driver communication, ×: No driver communication

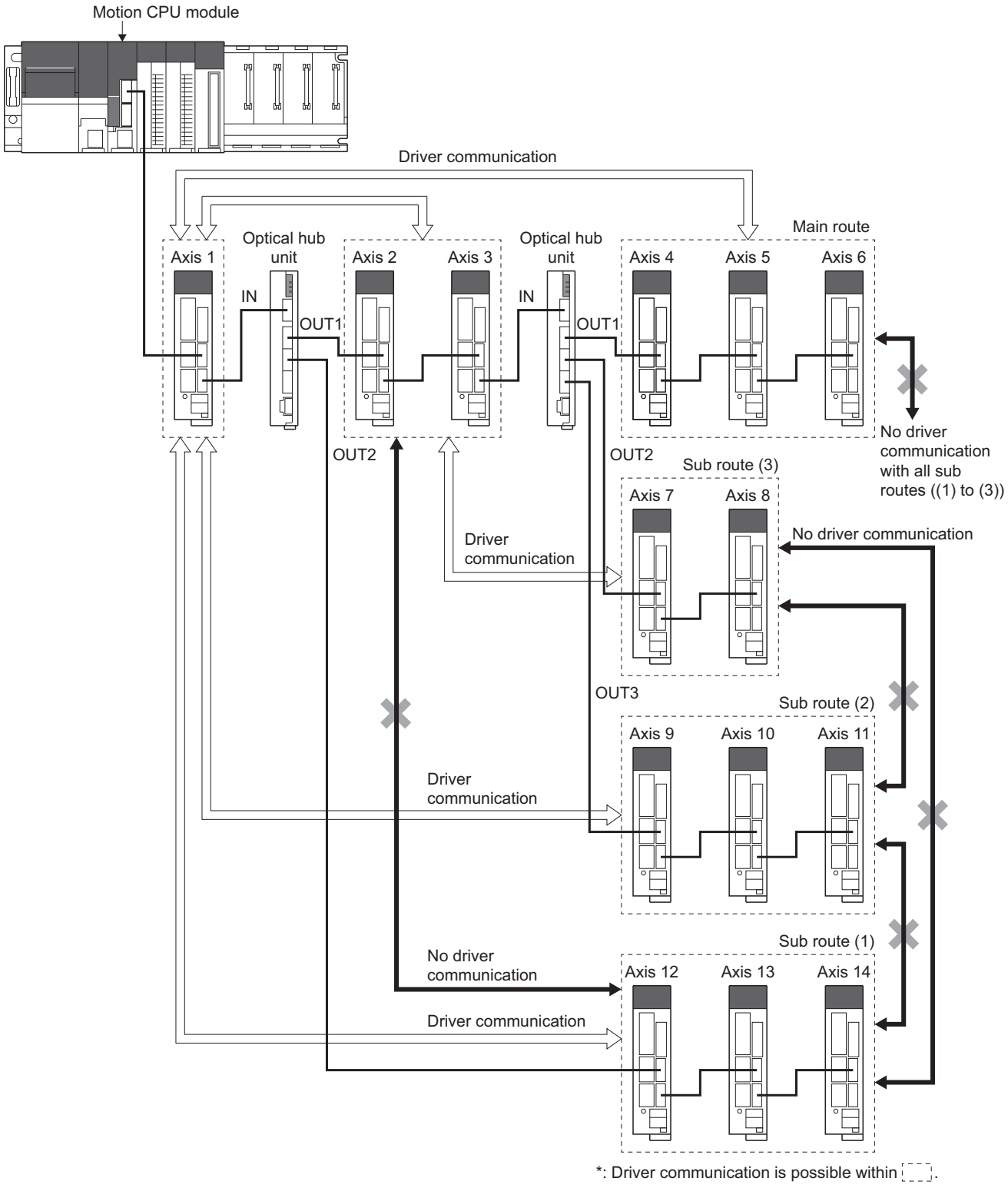
Route	Supported
Within the main route	○
Within the same sub route	○
Between different sub routes	×
Between main route and sub route (Between slaves on first optical hub unit (main route) and sub route)	○
Between main route and sub route (Between slaves on later optical hub unit (main route) and sub route)	×

Point

Refer to driver communication function for details of "Driver communication function". (☞ Page 137 Driver Communication Function)

■Servo amplifier layout for driver communication

A connection example showing where driver communication is possible/not possible is shown below.



6 COMMUNICATION FUNCTIONS

6.1 Communication Function List

Motion CPUs are equipped with following list of communication interfaces.

Communication type		Communication route		Reference
		Via Multiple CPU*1	PERIPHERAL I/F ( ) indicates the Ethernet port number.	
MELSOFT communication	Via Multiple CPU	○	—	—
	Direct connection	—	○(UDP5008)	☞ Page 183 Direct connection
	Via Ethernet hub	—	○(TCP5007, UDP5006)	☞ Page 186 Connection via HUB
	CPU search	—	○(UDP5009)	
Native mode communication with Cognex Corporation In-Sight® vision system		—	○(Arbitrary TCP)	☞ Page 191 Vision System Connection Function

*1 Communication via other CPU to Motion CPU is possible with a Multiple CPU system.

6.2 Security Function

The theft, tampering, incorrect operation, and illegal execution of customer assets stored on personal computers, or customer assets inside modules in the MELSEC iQ-R series system due to unauthorized access by a third party is prevented. Use each security function for the purposes below.

Data protection target	Purpose	Security function	Reference
Project	Prevents unauthorized program (program file units) viewing. (Uses a security key.)	Security key authentication function	☞ Page 175 Software security key authentication
Motion CPU	Prevents unauthorized program execution. (Uses a security key.)		
	Prevents unauthorized file reading/writing. (Uses a password.)	File password function	☞ Page 173 File password
	Recognizes the IP address of external devices via a PERIPHERAL I/F and blocks access with unauthorized IP addresses.	IP filter function	☞ Page 180 IP filter function

File password

This function is used to protect the data of Motion CPU by registering a password for the file in the Motion CPU.
Password authentication is required when reading/writing data.
There are two types of password, "Read protect" and "Write protect". Both settings can be specified for a single data item.

Data protected by file password

The data protected file password are shown below.

Data type	Data name	Protected content
Motion SFC parameter	Motion SFC parameter	Motion SFC parameter
Motion SFC program	Motion SFC program	Motion SFC program
Servo program	Servo program	Servo program and program allocation
R series common parameter	System parameter	System parameter
	CPU parameter	CPU parameter
	Module parameter	Module parameter
Servo parameter	Axis 1 to axis 32 servo parameter	Servo parameter (up to 32 axes)
Synchronous control parameter	Command generation axis parameter	Command generation axis parameter
	Synchronous encoder axis parameter	Synchronous encoder axis parameter
	Servo input axis parameter	Servo input axis parameter
	Axis 1 to axis 32	Synchronous control parameters (up to 32 axes)
Cam data	Cam data	Cam data (up to 1,024 data items)
Label/structured data types	Label/structured data types settings	Label/structured data types settings (Excluding label allocation information)
Device comment	Device comment	Device comment

Operations requiring password authentication with file password

Operations requiring password authentication for data for which a file password has been registered are as follows.

Online operation	Corresponding password type
Reading to Motion CPU	Read protect password
Writing to Motion CPU	Write protect password
Online change	Write protect password
Verification with Motion CPU	Read protect password
File password setting (registration/change/authentication/deletion)	Read protect password, write protect password
Motion CPU data deletion	Write protect password
Motion CPU memory formatting (initialization)	—*1
File transmission at boot*2	Read protect password, write protect password

*1 Password authentication is not required for Motion CPU memory formatting (initialization).

*2 Refer to file password for operation when file password is set. (☞ Page 112 File password)

File password setting

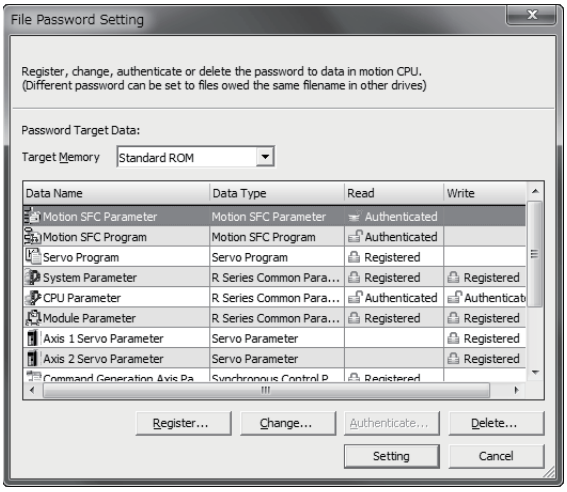
File password registration, change, authentication and deletion are performed in MT Developer2.

Refer to the following for details of the operation procedures.

📖Help of MT Developer2

[Project] → [Security] → [File Password Setting]

Window



Point

- Store passwords carefully. If a user has forgotten a registration password, initialize the memory where the password is registered (standard ROM of the Motion CPU, or SD memory card). However, if initializing the standard ROM all password data and data are cleared. Re-write the data to the Motion CPU. (☞ Page 233 Memory Initialization)
- When setting a file password for both the standard ROM and the SD memory card data, set a password for the standard ROM, and another password for the SD memory card data.

Software security key authentication

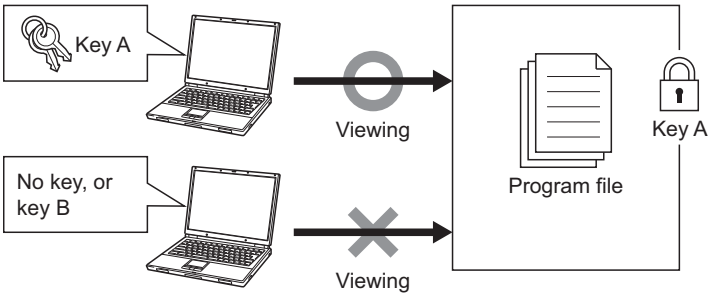
This function is used to protect the user data by setting a common security key to the project and Motion CPU to limit the personal computer which operates the project and Motion CPU which runs the project. The security key is created in MT Developer2 and registered to the personal computer, or Motion CPU. Security keys are set for the following.

Security key target		Application
Program file	Security keys can be registered for each program file, however, the same security key is used for all program files in a project.	• Restricts the viewing of program files inside the project. • Restricts the execution of programs with Motion CPUs.
Personal computer	Multiple security keys can be registered for a single personal computer.	Protected program files can be viewed with a security key.
Motion CPU	Only one security key can be written per CPU module.	Restricted programs can be executed by security keys.

Operations that can be restricted with security key authentication function

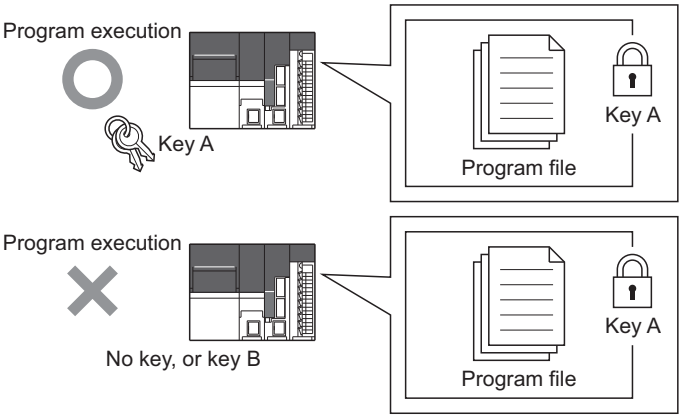
■Program viewing

Operation is controlled based on whether the security keys for program files and the personal computer match.



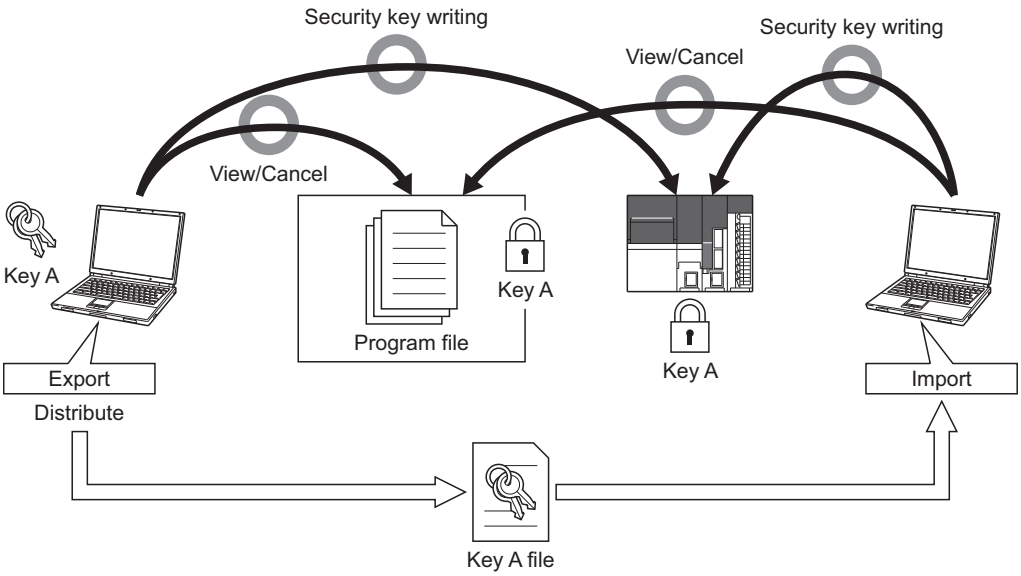
■Program execution inside Motion CPU

Operation is controlled based on whether program files written to the Motion CPU and Motion CPU security key match.



Copying security keys

Security keys registered in the personal computer can be imported or exported and used at another personal computer.
Expiry dates can be set for copied security keys.



Point

- Even if MT Developer2 is uninstalled, security keys set at the personal computer are not deleted. To delete, do so at the "Security key management" screen.
- Refer to security key for operation when performing file transmission at boot for a Motion CPU with a security key set. (☞ Page 113 Security key)

⚠CAUTION

Program asset outflow cannot be prevented if a personal computer at which a security key is set is misused by a third party, and therefore customers must take the following countermeasures to protect against this.

- Personal computer theft prevention measures (use of wire locks, etc.)
- Personal computer user management (deletion of redundant user accounts, strict control of login information, adoption of fingerprint authentication, etc.)

Furthermore, if a personal computer at which security keys are registered malfunctions, locked project data cannot be viewed or edited. Mitsubishi Electric accepts no responsibility for losses to customers, other individuals, or organizations as a result of this. Customers must therefore take the following countermeasures to protect against this.

- Import registered security keys to another personal computer.
- Store exported files containing registered security keys in a safe location.

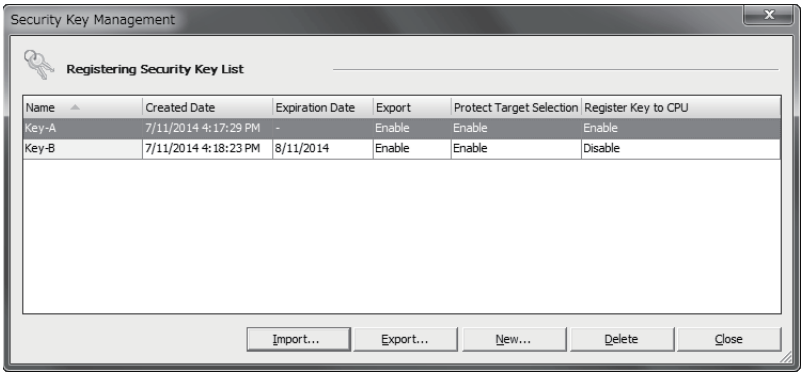
Creating/deleting/copying the software security key

The operation of software security key function is executed on the security key management screen of MT Developer2. Refer to the following for details of the operation procedures.

Help of MT Developer2

[Project] → [Security] → [Security Key Management]

Window



■Security key creation

Create a new security key and register it at the personal computer. Security keys are created for each personal computer login user, and up to 128 keys can be created, including newly created keys and imported keys.

■Security key deletion

Delete security keys registered in the personal computer. By deleting a security key used to lock a project, it will no longer be possible to view or edit locked data in the project. Furthermore, even if a security key with the same name is created after deleting, the security key will not be the same. Exercise sufficient caution when deleting security keys.

■Copying security keys

- Export

  Export security keys registered at the personal computer to an importable file (*.ity). An expiry date and operating restrictions can be added to security keys to be exported.
- Import

  Import exported security key files to the personal computer, and registers the security keys.

Point

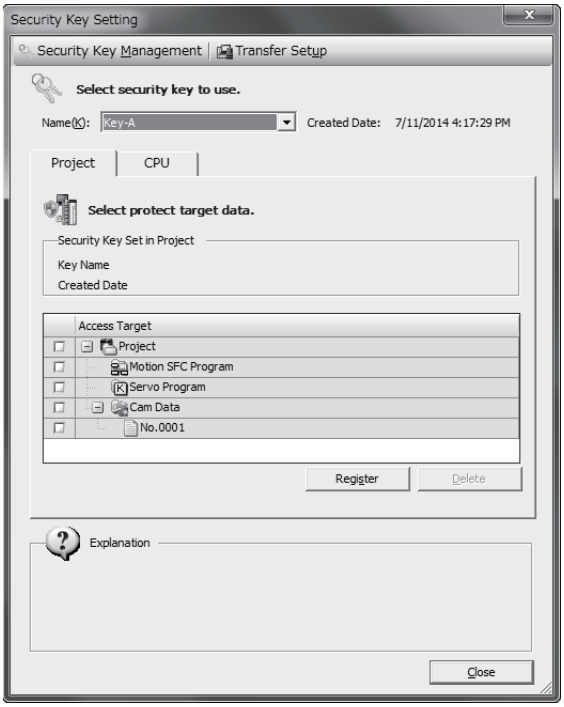
- Exercise strict control over exported security key files.
- If the expiry date for a security key registered at the personal computer expires, it will no longer be possible to view programs, export the security key again, set a security key for program files, or write a security key to the Motion CPU. If continuing to use the same security key after it has expired, first export the security key again from the personal computer from which it was exported, and then import it to the personal computer.

Registering a software security key to a project file

Create a security key at the "Security key management" screen beforehand.Security keys can be registered for each program file, however, the same security key is used for all program files in the project. Refer to following for details on operation.
Help of MT Developer2

[Project] → [Security] → [Security Key Setting]

Window



Operating procedure

■Registration procedure

1. Select the security key to be registered for the program file from "Name".
2. Select the check box for the program file for which viewing is to be prohibited from the [Project] tab, and then click the [Register] button. The security key set for the program file becomes valid when the project is saved.

■Deletion procedure

1. Select the security key (same key as the security key registered for the program file to be deleted) from "Name".
2. Select the check box for the program file for which the security key is to be deleted from the [Project] tab, and then click the [Delete] button.

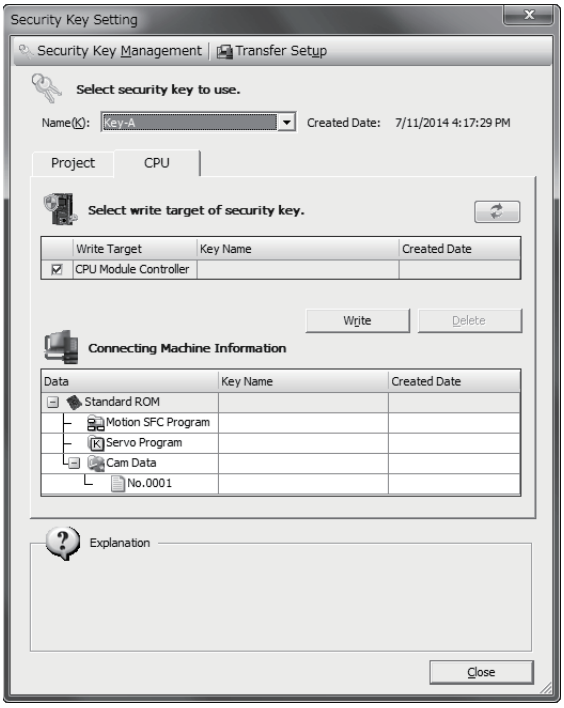
Writing/deleting software security keys to and from the Motion CPU

By writing a security key to the Motion CPU, the execution of programs can be prohibited for Motion CPUs in which a different key from that for the program file is written. A single security key can be written to multiple Motion CPUs. If writing a security key, create a key at the "Security key management" screen beforehand, and then connect to the Motion CPU. (Security keys can only be written or deleted when the Motion CPU is in the STOP status.) Refer to following for details on operation.

📖Help of MT Developer2

[Project] → [Security] → [Security Key Setting]

Window



Operating procedure

■Write procedure

1. Select the security key to be written to the Motion CPU from "Name".
2. Click the [Write] button from the [CPU] tab.

■Deletion procedure

1. Click the [Delete] button from the [CPU] tab.

IP filter function

By identifying the IP address of the device with which communication is being performed, access by specifying an unauthorized IP address can be prevented. Access is restricted by allowing or blocking access from IP addresses (of external devices) set in the parameters. By specifying the IP address of external devices to be allowed or blocked in the parameters, access from external devices is restricted. If used in an environment in which a LAN connection is established, use of this function is recommended. Refer to the following for details on IP filters.

MELSEC iQ-R Ethernet User's Manual (Application)

IP filter settings

IP filter settings are read to MT Developer2 when diverting parameters set at GX Works3 [Module Parameter] → "Application Setting" → "Security".

Point

If a proxy server exists on the LAN network, block the proxy server IP address. If allowed, it will no longer be possible to prevent access from personal computers capable of accessing the proxy server.

6.3 Remote Operation

Remote operation is used to control operation of Motion CPU from external sources (MT Developer2, RUN contacts, etc.).
Remote operations for which Motion CPU operations are controlled are as follows.

- Remote RUN/STOP

Relationship between Motion CPU status and remote operation

The status after the execution of remote operations based on the Motion CPU status is as follows.

Motion CPU status (switch position)	Remote operation	
	Remote RUN	Remote STOP
RUN	RUN status	STOP status
STOP	STOP status	STOP status

Remote RUN/STOP

The Motion CPU RUN/STOP status can be changed from an external source with RUN/STOP switch of Motion CPU module set to RUN.

Remote RUN/STOP operations

■Remote RUN

When remote RUN is performed when the status is STOP, the "[Rq.1120] PLC ready flag (M2000)" changes from OFF to ON (RUN status), and the "[Rq.1120] PLC ready flag (M2000)" OFF to ON operation is executed.

■Remote STOP

Turns the "[Rq.1120] PLC ready flag (M2000)" OFF (STOP status).

Remote RUN/STOP operation procedure

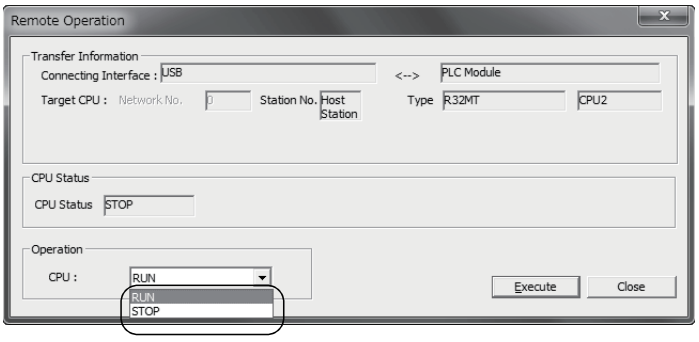
■Operation with MT Developer2

Select [RUN] or [STOP] on by remote operation to execute. Refer to the following for details of the operation procedure.

Help of MT Developer2

[Online] → [Remote Operation] → "RUN/STOP"

Window



■Operation with RUN contact

Set the X device to be set as the RUN contact at MT Developer2.

[R series common parameters] → [Motion CPU module] → [CPU parameter] → "Operation related setting" → "RUN contact"

The settable device range is "X0 to X2FFF". Operations are performed with the set RUN contact ON/OFF and remote RUN/STOP status.

- If the RUN contact is OFF, the status of the Motion CPU will be RUN. By executing a remote RUN/STOP in the RUN status, the Motion CPU RUN/STOP status can be switched.
- If the RUN contact is ON, the status of the Motion CPU will be STOP. The status of the Motion CPU will be STOP, even if remote RUN is performed in the STOP status.

Point

The "[Rq.1120] PLC ready flag (M2000)" can also be turned ON/OFF ("PCPU READY complete flag (SM500)" ON/OFF) in the following methods.

- RUN/STOP switch change

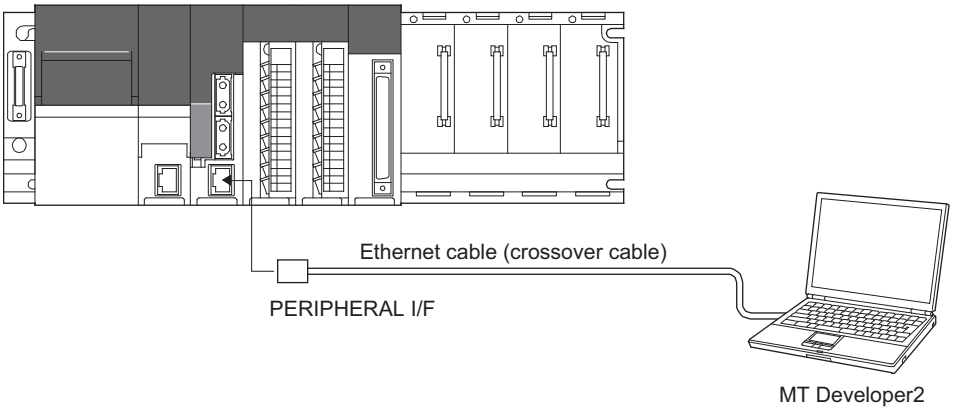
6.4 Communication Function via PERIPHERAL I/F

The Motion CPU can communicate data by connecting built-in PERIPHERAL I/F of the Motion CPU with personal computers and/or display devices, etc. using an Ethernet cable. There are following two ways to communicate between the Motion CPU and MT Developer2.

- "Direct connection" connected with the Ethernet cable
- "Connection via HUB" connected via HUB

Direct connection

Between the Motion CPU and MT Developer2 can be connected using one Ethernet cable without HUB.The direct connection enables communication with only specifying connection target. IP address setting is not required.



Point

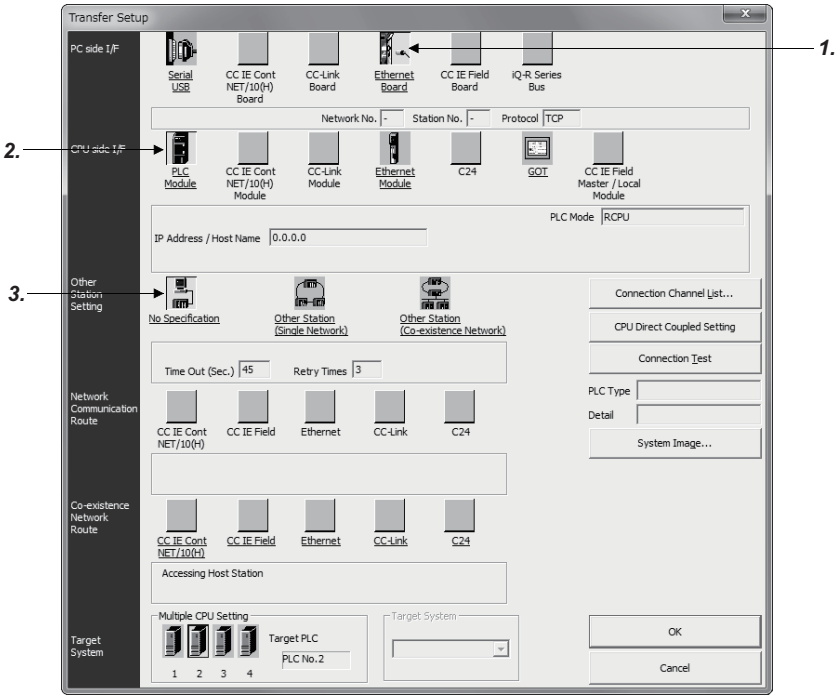
If connecting directly with an Ethernet cable, the wiring will be longer than a USB cable, and therefore it is possible that an unauthorized connection may be established from a distance.
By setting [R Series Common Parameters] → [Motion CPU Module] → [Module Parameters] → "Disable Direct Connection to MELSOFT" to "Disable" in order to prohibit a direct connection to MELSOFT, direct connections are prohibited, enabling unauthorized connections to be prevented.

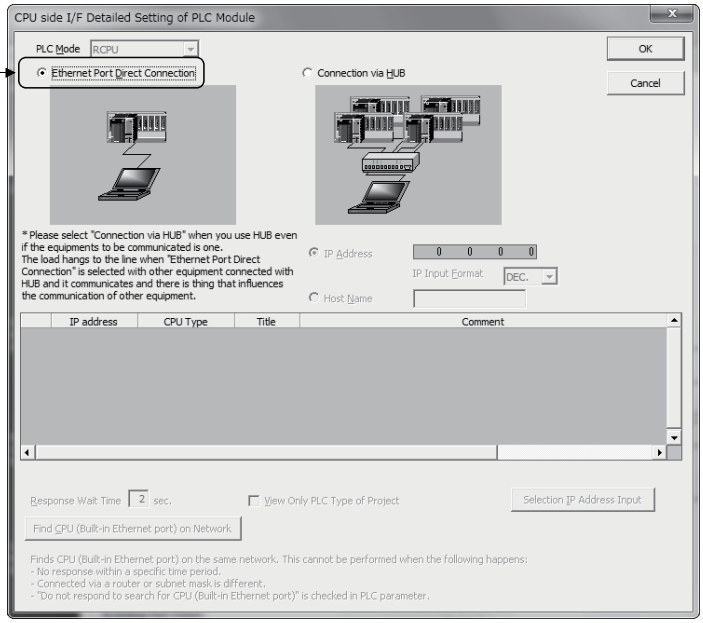
Communication setting in MT Developer2 side

Set the items on the Transfer Setup screen in MT Developer2 as shown below.

[Online] → [Transfer Setup]

Operating procedure




CPU side I/F Detailed Setting of PLC Module
PLC Mode
RCPU
Ethernet Port Direct Connection
Connection via HUB
OK
Cancel
* Please select "Connection via HUB" when you use HUB even if the equipments to be communicated is one.
The load hangs to the line when "Ethernet Port Direct Connection" is selected with other equipment connected with HUB and it communicates and there is thing that influences the communication of other equipment.
IP Address
IP Input Format
DEC.
Host Name
IP address
CPU Type
Title
Comment
Response Wait Time
2
sec.
View Only PLC Type of Project
Selection IP Address Input
Find CPU (Built-in Ethernet port) on Network
Finds CPU (Built-in Ethernet port) on the same network. This cannot be performed when the following happens:
- No response within a specific time period.
- Connected via a router or subnet mask is different.
- "Do not respond to search for CPU (Built-in Ethernet port)" is checked in PLC parameter.

Select "Ethernet port direct connection"

1. Select [Ethernet Board] for PC side I/F.
2. Select [PLC Module] for CPU side I/F. Select the "Ethernet Port Direct Connection" on the CPU side I/F Detailed Setting of PLC Module screen.
3. Make the setting for Other Station Setting. Select it according to the operating environment.

Precautions

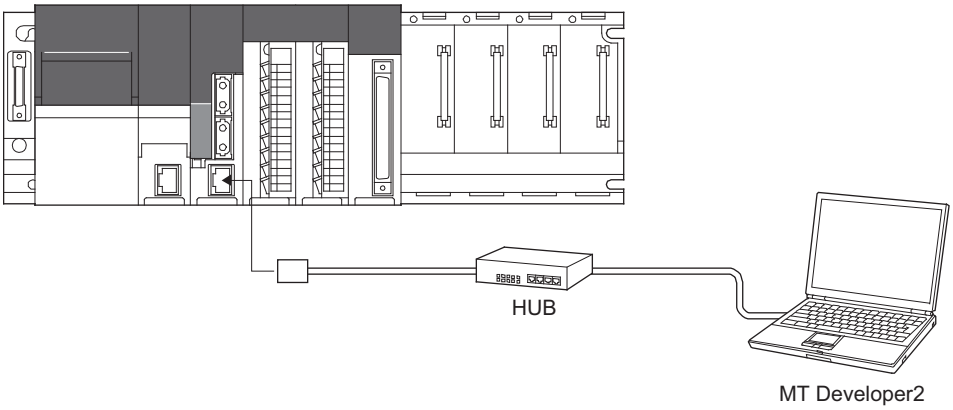
Precautions for direct connection are shown below.

■Connection to LAN line

When the Motion CPU is connected to LAN line, do not perform communication using direct connection. If performed, the communication may put a load to LAN line and adversely affect communications of other devices.

■Connection not connected directly

- The system configuration that connects a Motion CPU with an external device using a hub as shown below is not regarded as direct connection.



- When two or more Ethernet ports are enables in the network connections setting on the personal computer, communication by direct connection is not possible. In the setting, leave only one Ethernet port enabled for direct connection and disable the other Ethernet ports.

■Condition in which direct connection communication may not be available

Under the following conditions, direct connection communication may not be available. In that case, check the setting of the Motion CPU and/or personal computer.

- In the Motion CPU IP address, bits corresponding to "0" in the personal computer subnet mask are all ON or all OFF.

Ex.

Motion CPU IP address: 64.64.255.255

Personal computer IP address: 64.64.1.1

Personal computer subnet mask: 255.255.0.0

- In the Motion CPU IP address, bits corresponding to the host address for each class in the personal computer IP address are all ON or all OFF.

Ex.

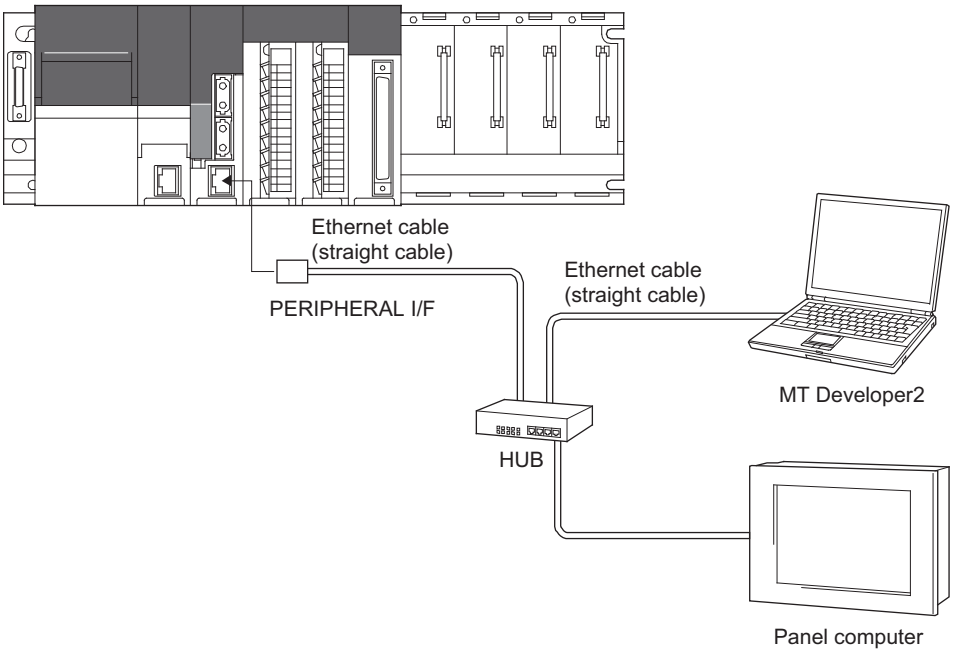
Motion CPU IP address: 64.64.255.255

Personal computer IP address: 192.168.0.1

Personal computer subnet mask: 255.0.0.0

Connection via HUB

Between the Motion CPU and MT Developer2 can be connected via HUB.

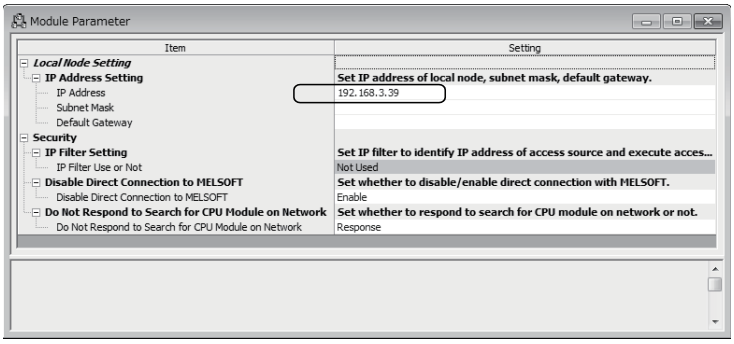


Setting in Motion CPU side

Set the items on the IP address setting as shown below.

[R Series Common Parameter] → [Motion CPU Module] → [Module Parameter] → "IP Address Setting"

Operating procedure


Module Parameter
Item
Setting
Local Node Setting
IP Address Setting
Set IP address of local node, subnet mask, default gateway.
IP Address
192.168.3.39
Subnet Mask
Default Gateway
Security
IP Filter Setting
Set IP filter to identify IP address of access source and execute acces...
IP Filter Use or Not
Not Used
Disable Direct Connection to MELSOFT
Set whether to disable/enable direct connection with MELSOFT.
Disable Direct Connection to MELSOFT
Enable
Do Not Respond to Search for CPU Module on Network
Set whether to respond to search for CPU module on network or not.
Do Not Respond to Search for CPU Module on Network
Response

1. Set the Motion CPU IP address. (Default IP address: 192.168.3.39) Change the IP address if required. No need to set "Subnet Mask Pattern" and "Default Router IP Address".

■Enabling the parameters of Motion CPU

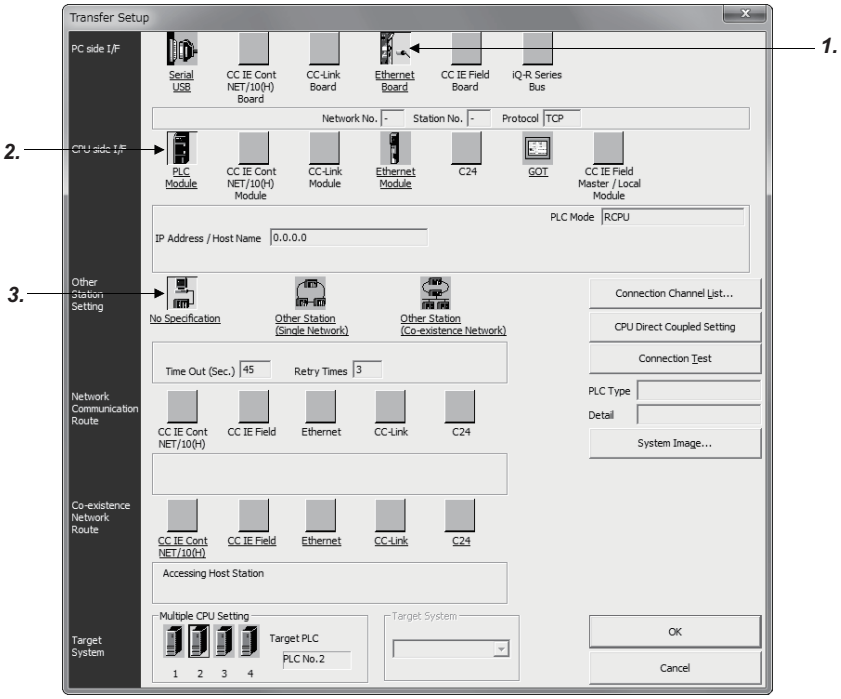
Using Ethernet direct connection or USB/RS-232 connection, write the settings in parameter to the Motion CPU by selecting [Online] - [Write to CPU] in MT Developer2. After writing the parameter settings, power the Multiple CPU system OFF to ON or reset using the RUN/STOP/RESET switch so that the parameters become valid. Connect directly with an Ethernet cable between the personal computer and Motion CPU to write the parameters using the Ethernet cable. (☞ Page 183 Direct connection)

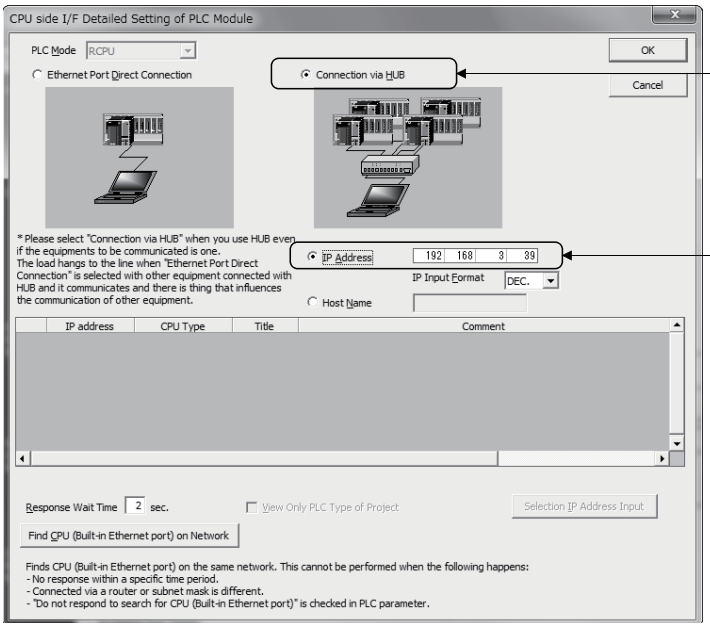
Communication setting in MT Developer2 side

Set the items on the Transfer Setup screen in MT Developer2 as shown below.

[Online] → [Transfer Setup]

Operating procedure




CPU side I/F Detailed Setting of PLC Module
PLC Mode RCPU
Ethernet Port Direct Connection
Connection via HUB
OK
Cancel
Select "Connection via HUB"
* Please select "Connection via HUB" when you use HUB even if the equipments to be communicated is one. The load hangs to the line when "Ethernet Port Direct Connection" is selected with other equipment connected with HUB and it communicates and there is thing that influences the communication of other equipment.
IP Address 192 168 3 39
IP Input Format DEC.
Host Name
Set the IP address of the Motion CPU
IP address
CPU Type
Title
Comment
Response Wait Time 2 sec.
View Only PLC Type of Project
Selection IP Address Input
Find CPU (Built-in Ethernet port) on Network
Finds CPU (Built-in Ethernet port) on the same network. This cannot be performed when the following happens:
- No response within a specific time period.
- Connected via a router or subnet mask is different.
- "Do not respond to search for CPU (Built-in Ethernet port)" is checked in PLC parameter.

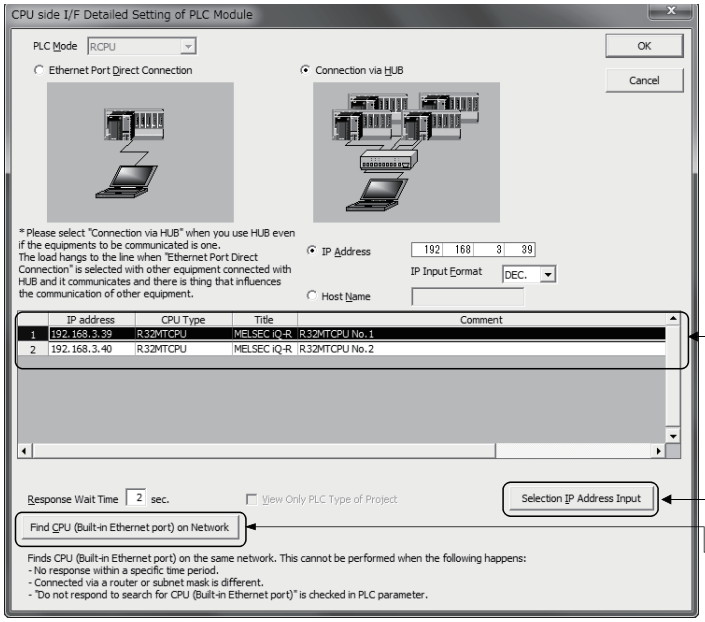
1. Select [Ethernet Board] for PC side I/F.

2. Select [PLC Module] for CPU side I/F. Select the "Connection via HUB" on the CPU side I/F Detailed Setting of PLC Module screen, and set the Motion CPU IP address.

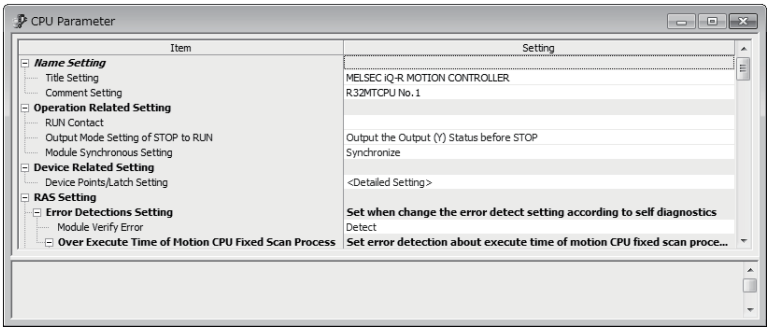
3. Make the setting for Other Station Setting. Select it according to the operating environment.

Point

The Find CPU function can be used for specifying the IP address for Motion CPU side in the connection via HUB. This function can be activated in [Find CPU (Built-in Ethernet port) on Network] of CPU side I/F Detailed Setting of PLC Module screen, finds the Motion CPU connected to the same HUB as MT Developer2, and displays a list. Select the connecting Motion CPU and click [Select IP Address Input] button to set the IP address for Motion CPU side.


CPU side I/F Detailed Setting of PLC Module
PLC Mode
RCPU
OK
Cancel
Ethernet Port Direct Connection
Connection via HUB
* Please select "Connection via HUB" when you use HUB even if the equipments to be communicated is one. The load hangs to the line when "Ethernet Port Direct Connection" is selected with other equipment connected with HUB and it communicates and there is thing that influences the communication of other equipment.
IP Address
192 168 3 39
IP Input Format
DEC.
Host Name
IP address
CPU Type
Title
Comment
1 192.168.3.39 R32MTCPU MELSEC iQ-R R32MTCPU No.1
2 192.168.3.40 R32MTCPU MELSEC iQ-R R32MTCPU No.2
Response Wait Time
2
sec.
View Only PLC Type of Project
Selection IP Address Input
Find CPU (Built-in Ethernet port) on Network
Finds CPU (Built-in Ethernet port) on the same network. This cannot be performed when the following happens:
- No response within a specific time period.
- Connected via a router or subnet mask is different.
- "Do not respond to search for CPU (Built-in Ethernet port)" is checked in PLC parameter.
Found Motion CPU is displayed
[Selection IP address input] button
[Find CPU (Built-in Ethernet port) on network] button

- Set the title and comment of the Motion CPU in name setting. The title and comment set are displayed on the CPU side I/F Detailed Setting of PLC Module screen. (☞ Page 48 CPU parameter)



- By setting "Do not respond to search for CPU Module on network" ([R Series Common Parameter] → [Motion CPU Module] → [Module Parameter] → "Do not respond to search for CPU Module on network") to "Not responded" the CPU module does not appear in the list after a search on the network.

Precautions

Precautions for connection via HUB are shown below.

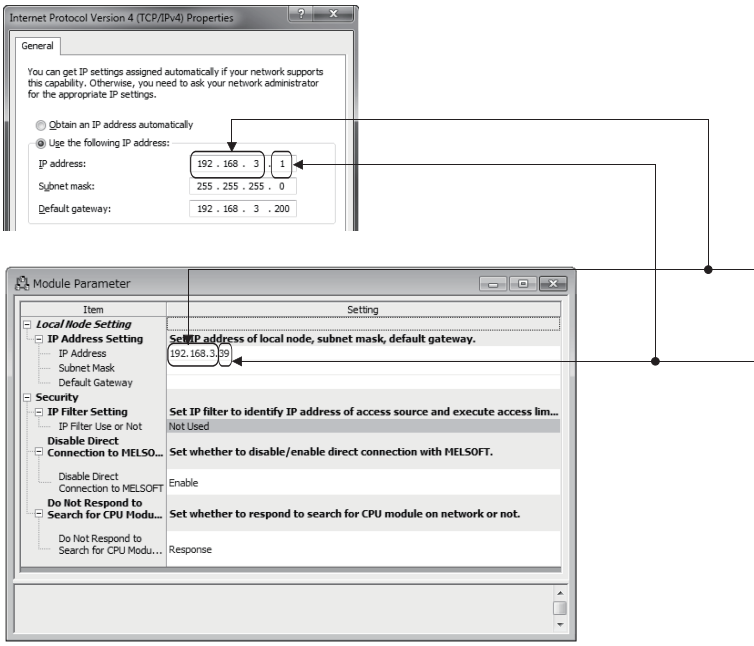
- When the personal computer that can connect to LAN line is used, set the same value for Motion CPU IP address as the following personal computer IP address.

Motion CPU IP address: 192 168 3 39

Set the same value as the personal computer IP address

Ex.

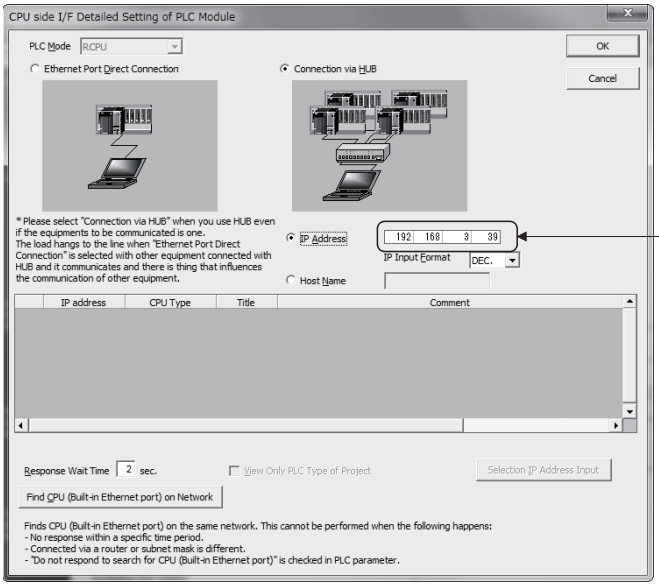
Personal computer IP address: "192.168.3.1"


Internet Protocol Version 4 (TCP/IPv4) Properties
General
You can get IP settings assigned automatically if your network supports this capability. Otherwise, you need to ask your network administrator for the appropriate IP settings.
Obtain an IP address automatically
Use the following IP address:
IP address: 192 . 168 . 3 . 1
Subnet mask: 255 . 255 . 255 . 0
Default gateway: 192 . 168 . 3 . 200
Module Parameter
Item
Setting
Local Node Setting
IP Address Setting
Set IP address of local node, subnet mask, default gateway.
IP Address
192.168.3.39
Subnet Mask
Default Gateway
Security
IP Filter Setting
Set IP filter to identify IP address of access source and execute access lim...
IP Filter Use or Not
Not Used
Disable Direct Connection to MELSO...
Set whether to disable/enable direct connection with MELSOFT.
Disable Direct Connection to MELSOFT
Enable
Do Not Respond to Search for CPU Modu...
Set whether to respond to search for CPU module on network or not.
Do Not Respond to Search for CPU Modu...
Response

<Setting for Motion CPU side>

Set the same value as the personal computer IP address.
(Example) 192.168.3.☐

Set the IP address not used with devices connected to network.
(Example) ☐.☐.☐.39


CPU side I/F Detailed Setting of PLC Module
PLC Mode
RCPU
OK
Cancel
Ethernet Port Direct Connection
Connection via HUB
* Please select "Connection via HUB" when you use HUB even if the equipments to be communicated is one. The load hangs to the line when "Ethernet Port Direct Connection" is selected with other equipment connected with HUB and it communicates and there is thing that influences the communication of other equipment.
IP Address
192 168 3 39
IP Input Format
DEC.
Host Name
IP address
CPU Type
Title
Comment
Response Wait Time
2
sec.
View Only PLC Type of Project
Selection IP Address Input
Find CPU (Built-in Ethernet port) on Network
Finds CPU (Built-in Ethernet port) on the same network. This cannot be performed when the following happens:
- No response within a specific time period.
- Connected via a router or subnet mask is different.
- "Do not respond to search for CPU (Built-in Ethernet port)" is checked in PLC parameter.

<Setting for MT Developer2 side>

Set the same value as the Motion CPU IP address.
(Example) 192.168.3.39

- The maximum number of devices that can access to one Motion CPU simultaneously is 16.
- Hubs with 10BASE-T or 100BASE-TX ports can be used. (The ports must comply with the IEEE802.3 100BASE-TX or IEEE802.3 10BASE-T standards.)
- The Ethernet cables must to be installed away from power cabling/lines.

- The module operation is not guaranteed if any of the following connection is used. Check the module operation on the user side.
  - Connections using the Internet (general public line)
  - Connections using devices in which a firewall is installed
  - Connections using broadband routers
  - Connections using wireless LAN
- When multiple Motion CPUs are connected to MT Developer2, beware of the below cautions:
  - IP addresses must be different for each Motion CPU.
  - Different projects must be used for each Motion CPUs on MT Developer2.

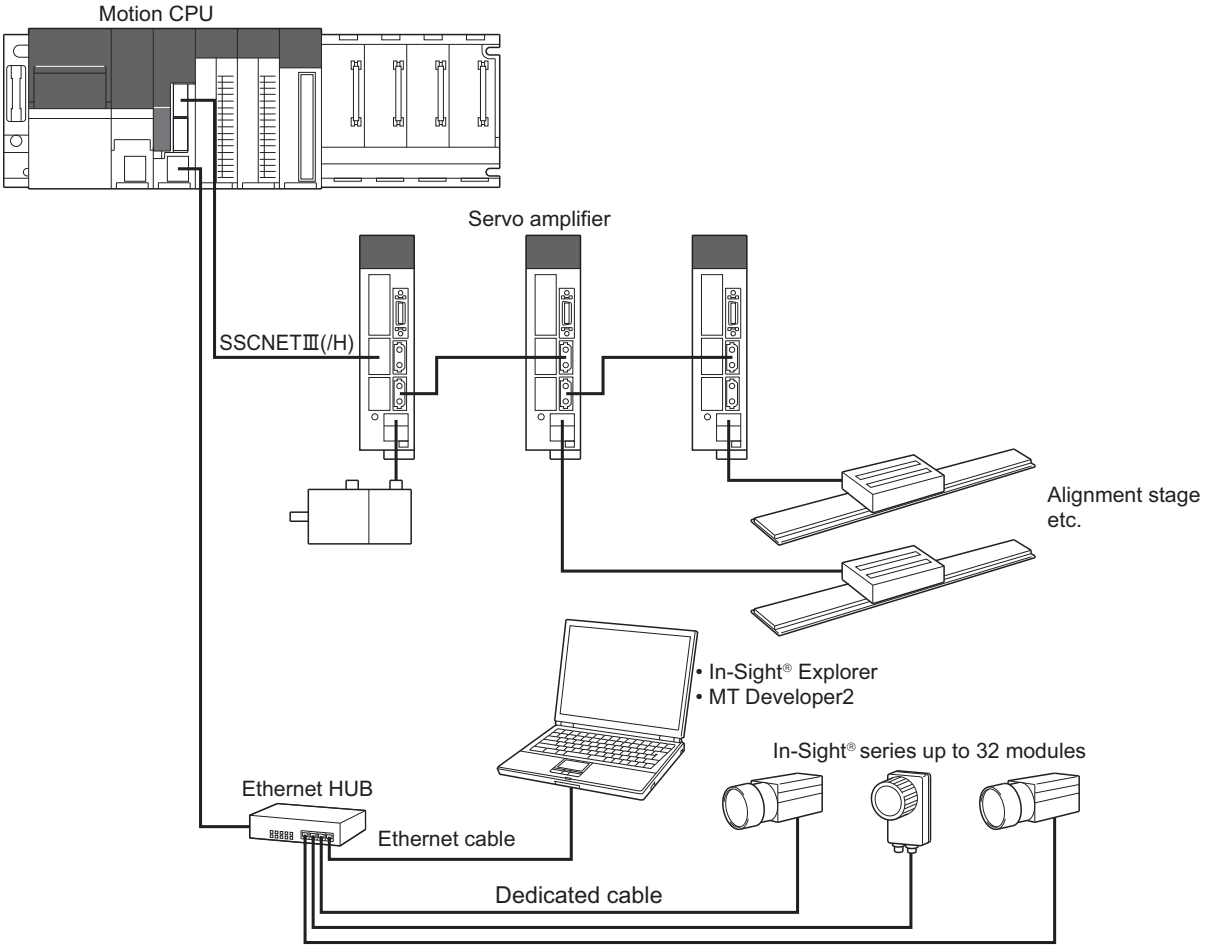
6.5 Vision System Connection Function

The Cognex In-Sight® vision system can be connected to the PERIPHERAL I/F of the Motion CPU.
The vision system dedicated functions have been added to the Motion SFC program making it easy to control the vision system from the Motion SFC program.
Refer to the Cognex vision system manual or help sections for details on the In-Sight® vision system and Cognex vision system integrating tool In-Sight®Explorer.
The following terms are used to explain the vision system connection function.

Term	Description
In-Sight® Explorer	Abbreviation for Cognex vision system integrating tool In-Sight® Explorer (Version 4.3.0 or later).
Log on/Log off	Procedure to connect/disconnect the communication to the vision system from the Motion CPU.
PoE	Abbreviation for Power over Ethernet. Method of supplying power via an Ethernet cable.
Native mode	Vision system's communication method used to control the vision system from the Motion CPU.
TCP/IP	One of vision system's communication protocol names.
Job (Vision program)	Program that processes images in the vision system.
Load	The process of developing a job file stored in the vision system into the memory in the vision system, and making it an active job.
Trigger	Start signal for acquiring images.
Vision system status storage device	Device that stores the status of the vision system controlled by the Motion CPU.
Program status storage device	Device that stores the status of jobs controlled by the Motion CPU.
Image data	Various data created by the vision system's image process. (Not images acquired by the trigger.)
Read value	Numeric data retrieved in addition to the image data.
Spreadsheet	A table (400 line × 26 row) in which the job is written. The program is created by writing the functions of various image processes, etc., in each spreadsheet cell.
Tag	Symbolic tag associated with the spreadsheet cells.

System configuration

This section explains the system configuration and precautions for using the Cognex vision system connection function.



Point

Depending on the vision system used, power supply by Power over Ethernet (PoE) may be required.
The Motion CPU's PERIPHERAL I/F does not support PoE, so a PoE power source equipment (PSE) is required.

Features of vision system connection function

This section explains the features of the Cognex vision system connection function.

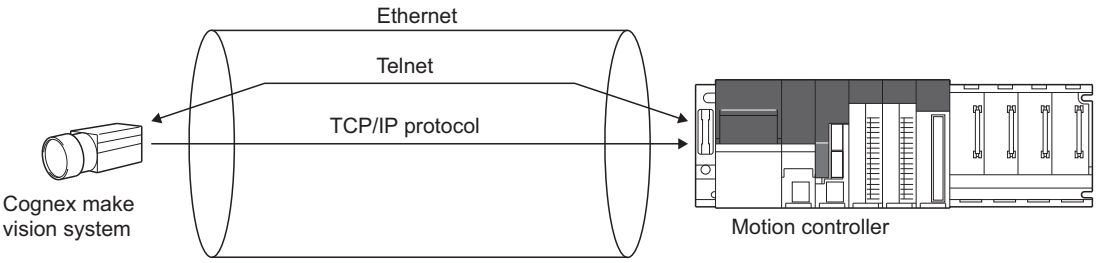
■Method of connection with vision system

The Motion CPU and vision system are connected with the Motion CPU's PERIPHERAL IF (Ethernet). A dedicated communication module, etc., is not needed.

Point

- The Motion CPU and vision system are connected via Ethernet. The response of vision system dedicated functions may slow down if several devices (MT Developer2, personal computer for In-Sight® Explorer or GOT, etc.) are connected via an Ethernet HUB.
- When simultaneously controlling two or more vision systems, the execution of commands to other vision systems may be delayed during the log on process (MVOPEN) with a specific vision system.
- When simultaneously controlling two or more vision systems, if the offline-online state for a specific vision system is switched from an external source, the execution of commands to other vision systems may be delayed.
- Execution of the vision system dedicated functions may be delayed if the vision system is in the offline state.
- When the vision system is logged onto, communication is established between the Motion CPU and vision system to check the connection state even if the vision system dedicated functions are not used.

The following two communication methods can be used simultaneously with Ethernet.*1



*1 The simultaneous communication cannot be used depending on the vision system's model. Refer to the Cognex vision system manual or help sections to confirm the specifications of vision system.

- Telnet
  The vision system is controlled from the Motion CPU using the native mode. The vision system dedicated functions control the vision system using Telnet.
- TCP/IP protocol
  By using TCP/IP as the vision system communication protocol and setting the output string, the image data are sent in a batch to the Motion CPU immediately after the job is finished with the vision system. High-speed data transfer is possible compared to the other communication methods.

■Vision system parameter

Parameters required for Ethernet communication and job execution must be set beforehand with MT Developer2. The vision system can be controlled just by writing only the vision system dedicated functions in the Motion SFC program.

■Priority of the vision system dedicated function

The priority of the vision system dedicated functions in the Motion CPU are shown below.

Process	Description	Priority
Motion operation process	Servo operation process, Servo data communication process, Event task of Motion SFC, etc.	1 (High)
Vision system dedicated function	Execution of the communication process with the vision system	2
Motion main process	Communication process with the peripheral devices, Auto refresh process, Normal task process of Motion SFC	3 (Low)

Point

- The communication process with the vision system has a lower priority than the motion operation cycle, so the motion operation processing time is not affected.
- Even if the vision system dedicated function is executed from the Motion SFC event task or NMI task, communication process with the vision system is executed after the motion operation process.

Vision system parameter setting

This section describes the setting items for vision system parameter system.

Point

When writing the vision system parameters into the Motion CPU, execute one of the following.

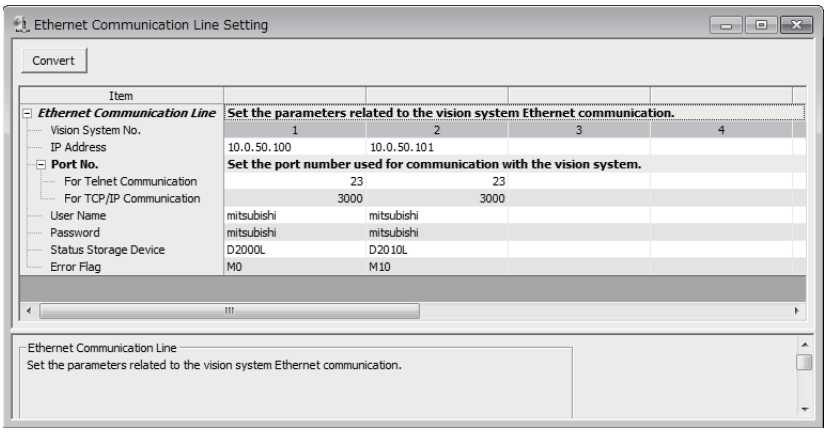
- Select the menu bar [Check/Convert] - [Vision System Parameter Check].
- Click [Convert] button of Ethernet communication line setting screen or vision program operation setting screen.

Ethernet Communication Line Setting

Set the parameters related to the vision system Ethernet communication.

[Motion CPU Common Parameter] → [Vision System Parameter] → "Ethernet Communication Line"

Window



Displayed items

Item		Setting Range
Vision system No.		1 to 32
IP address		0.0.0.1 to 255.255.255.254
Port No.	For telnet communication	1 to 65535 *: Cannot use 21, 68, 80, 502, 1069, 1070, 1212, 2222, 44818, 50000
	For TCP/IP communication	
User name		Up to 15 characters
Password		Up to 15 characters
Status storage device		Word device
Error flag		Bit device

■Vision System (camera) No. (Not necessary to set)

This number (1 to 32) is used by the vision system dedicated function to identify the vision system.

■IP Address

Set the IP address set for each vision system.

■Port No.

Set the port number used for communication with the vision system. Set the same number as the port number set for the vision system with In-Sight® Explorer.

- For Telnet communication
  Set the Telnet connection port number used to control the vision system from the Motion CPU.
  If this number is not set, the Telnet default port number (23) will be used.
- For TCP/IP communication
  Set the vision system's TCP/IP server port number used to batch send the vision system job execution results with the format output string setting of TCP/IP protocol. This does not need to be set when not using the format output string setting of TCP/IP protocol.

■User Name

Select a user from those set in the vision system to be used when executing the vision system dedicated functions.

Point

Select a user name for which the access level is set to "Full Access" or "Protect" in the In-Sight® Explorer user list.

■Password

Set the password corresponding to the set user name.

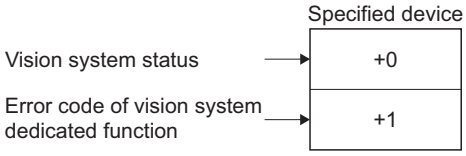
■Status Storage Device

Set the word device in which the vision system status and vision system dedicated function error codes are set.
Refer to device list for the range of word devices that can be set. (☞ Page 66 Device List)

Point

Set the device No. as an even-number.

The vision system status and error code of vision system dedicated function are stored in two successive points of the specified device as shown below.

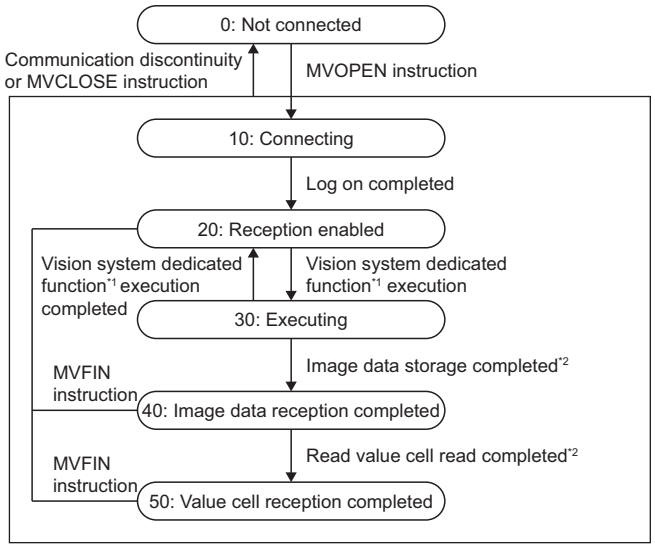


Both of them are set to 0 at the Multiple CPU system's power supply ON.

Refer to error codes for the error code of vision system dedicated function. (☞ Page 249 Error Codes)

The vision system status is indicated with the following values.

Storage value	Status	
0	Not connected	Status before logging onto the vision system.
10	Connecting	Status while executing log onto the vision system.
20	Reception enabled	Status in which the vision system has been logged onto, and the vision system dedicated functions can be executed.
30	Executing	Status in which vision system dedicated functions are being executed. Other vision system dedicated functions cannot be executed in this status.
40	Image data reception completed	Status in which the vision system job executed by the vision system dedicated function has been completed, and batch send of the image data has been completed. The image data storage device value can be used by the Motion SFC.
50	Value cell reception completed	Status in which the Motion CPU has received the data acquired by the job in the vision system. The read data storage device value can be used by the Motion SFC.



*1: MVLOAD, MVTRG, MVPST, MVIN, MVOUT, MVCLOSE and MVCOM instruction

*2: When the vision system job is started by the MVTRG instruction or MVPST instruction, if the image data storage device or read value storage device is set, the program will jump to line 40 or 50 at a normal completion. If the process ends abnormally, the program will jump to line 20.

■Error Flag

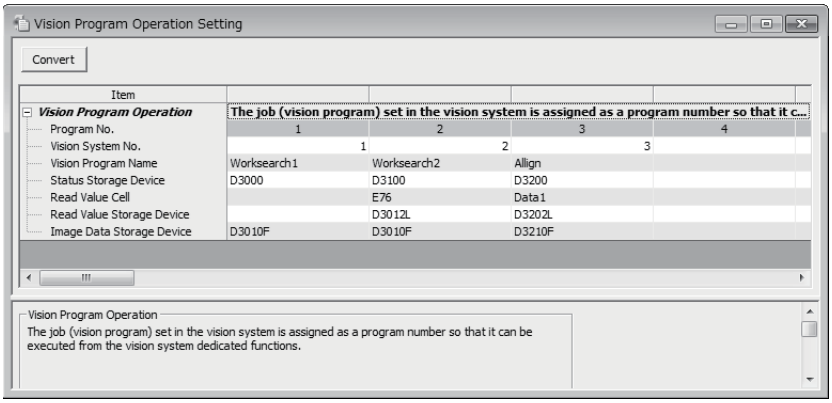
Set the bit device that turns ON if an error is detected when the vision system dedicated function is executed. Refer to device list for the range of bit devices that can be set. (☞ Page 66 Device List)

Vision Program Operation Setting

The job (vision program) set in the vision system is assigned as a program number so that it can be executed from the vision system dedicated functions.

[Motion CPU Common Parameter] → [Vision System Parameter] → "Vision Program Operation"

Window



Displayed items

Item	Setting Range
Program No.	1 to 128
Vision system No.	1 to 32
Vision program name	Up to 32 characters
Status storage device	Word device
Read value cell	Up to 32 characters
Read value storage device	Word device
Image data storage device	Word device

■Program No. (Not necessary to set)

This number (1 to 128) is used by the vision system dedicated function to identify the vision system job.

■Vision System (camera) No.

Set the vision system number corresponding to the vision system that is executing the job.

■Vision Program Name

Set the name of the job executed by the vision system dedicated function.

■Status Storage Device

Set the word device that stores the job's load status and the vision system's online/offline status. Refer to device list for the range of word devices that can be set. (☞ Page 66 Device List)

Both of them are set to 0 at the Multiple CPU system's power supply ON. The job's load status is indicated with the following values.

Storage value	Status	
0	Job not loaded or offline	The job is not loaded, or even if loaded is offline. (An error occurs if a trigger is issued.)
1	Job loading completed and online	The job has been loaded and is online. (The job is executed if a trigger is issued.)

Point

The vision program status storage device value is refreshed at the following timing.

- When a job is loaded by the MVLOAD instruction or MVPST instruction. (Refreshed immediately after loading.)
- When the vision system's online/offline status changes.
- When a job is loaded from a source other than the Motion CPU (In-Sight® Explorer, etc.). (Refreshed several seconds after loading.)
- When job is loaded and an online vision system is logged onto with the MVOPEN instruction. (Refreshed several seconds after logging on.)

■Read Value Cell/Read Value Storage Device

Set this to store the vision system tag or numeric data of spreadsheet in the Motion CPU device. This does not need to be set if the numeric data does not need to be referred to.

Point

- The vision system image data can be stored in the image data storage device by setting the format output string setting of TCP/IP protocol.
- When the data stored in the set tag or spreadsheet cell is not an integer value, the value after truncation of decimal point is stored in the read value storage device.
- If a spreadsheet cell is designated when using the vision system In-Sight® EZ series, an error will occur when the job is executed.

The tag or spreadsheet cell is set in the Read Value Cell.

Setting with tag	Write the symbolic tag name in the original state. (Example) Tag: Job.Pass_count → Set "Job.Pass_count".
Setting with cell	Write the spreadsheet row (A to Z) and line (0 to 399). (Example) Cell: A5 → Set "A5".

The device storing the value set in the tag or spreadsheet cell is set in the read value storage word device. Refer to device list for the range of word devices that can be set. (☞ Page 66 Device List)

Point

Set the device No. as an even-number.

The cell or tag value is stored as a 32-bit integer value in two successive points of the set device.

■Image Data Storage Device

Set the word device for storing the image data obtained when the job was executed.

Point

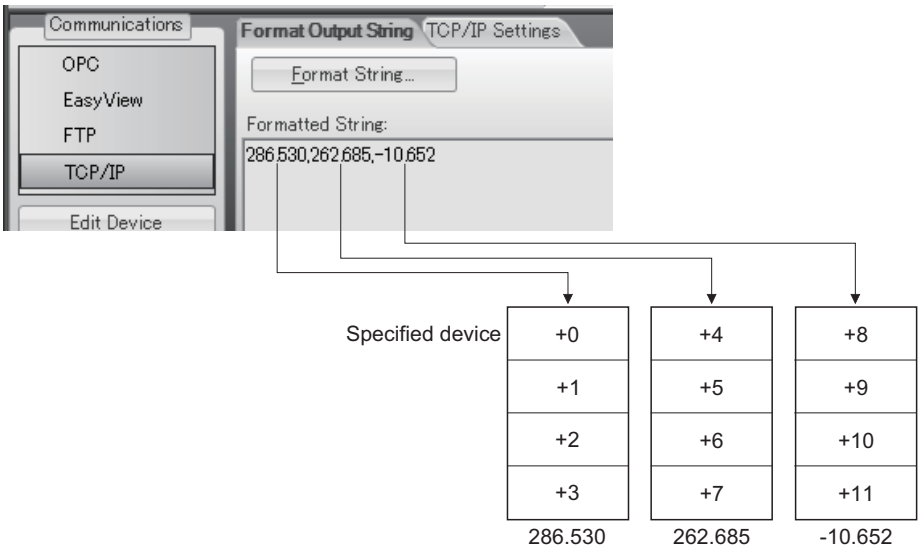
The image data is stored only when the format output string setting of TCP/IP protocol is set in the vision system. (☞ Page 201 Setting batch send (TCP/IP protocol) of multiple data)

This does not need to be set if the format output string setting of TCP/IP protocol is not set in the vision system. Refer to device list for the range of word devices that can be set. (☞ Page 66 Device List)

Point

Set the device No. as an even-number.

The image data is stored as a 64-bit floating point type every four successive points from the specified device equivalent to the output data set with the format output string setting of TCP/IP protocol.
Use the type conversion instruction of Motion SFC according to the application.

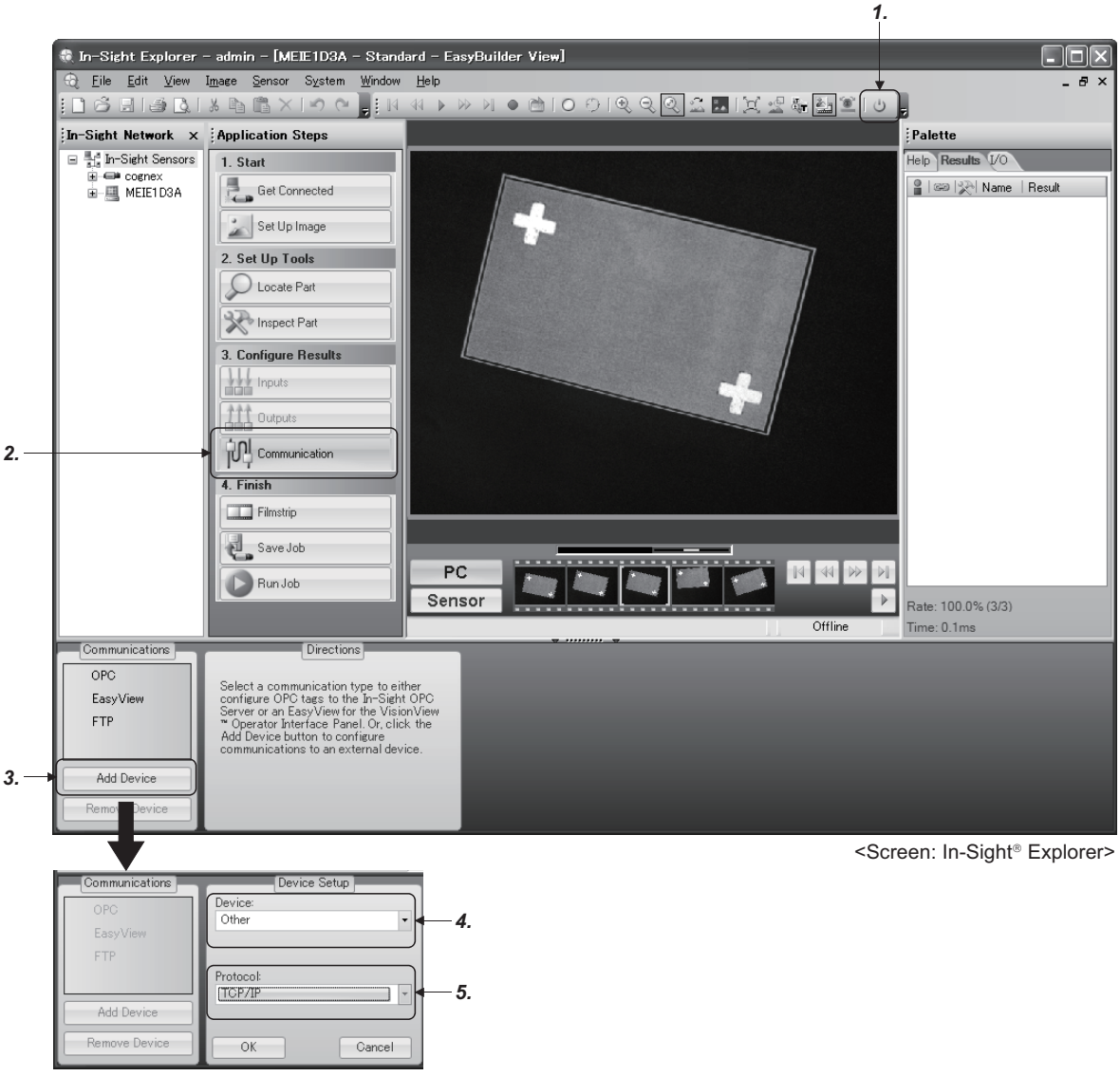


Setting batch send (TCP/IP protocol) of multiple data

By using the format output string setting of TCP/IP protocol, image data after the job is finished can be sent in a batch to the Motion CPU. Set with the following procedure using In-Sight® Explorer.

Operating procedure

1. Click the [Online] icon on the tool bar, and shift to the offline mode.
2. Click the [Communication] button under Application Steps to display the Communications screen.
3. Click the [Add Device] button to display the screen of Device Setup.
4. Select "Other" for "Device".
5. Select "TCP/IP" for "Protocol", and click the [OK] button.



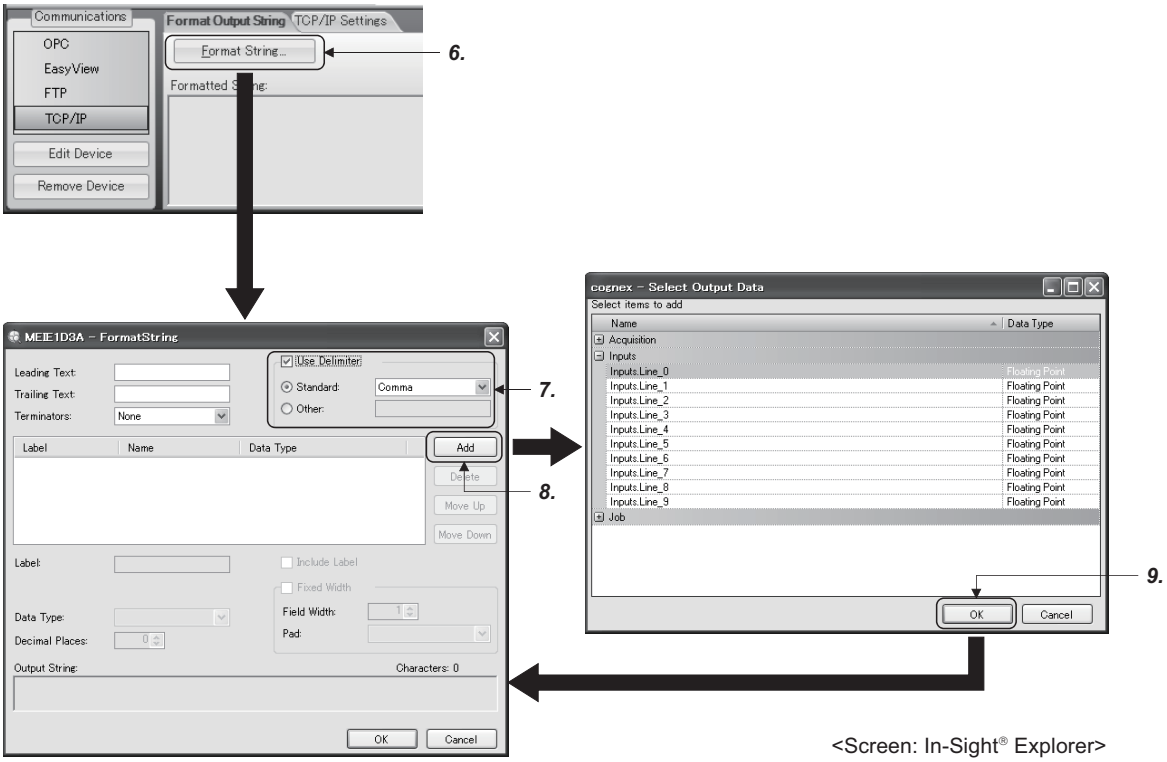
<Screen: In-Sight® Explorer>

6. The “TCP/IP” device will be added. Click the [Format String] button to display the FormatString dialog.

7. Set "Use Delimiter", and set the selectable character with "Standard".

8. Click the [Add] button to display the Select Output Data dialog.

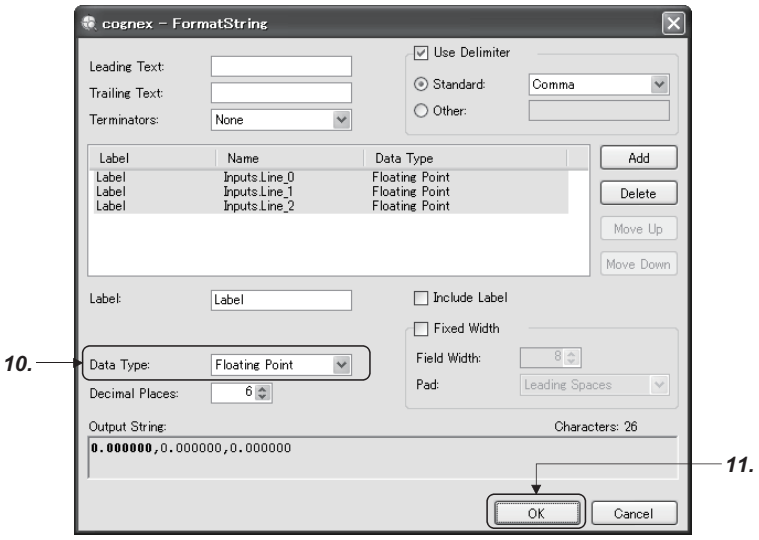
9. Select the data to be sent to the Motion CPU as the result of the job execution, and then click the [OK] button.



<Screen: In-Sight® Explorer>

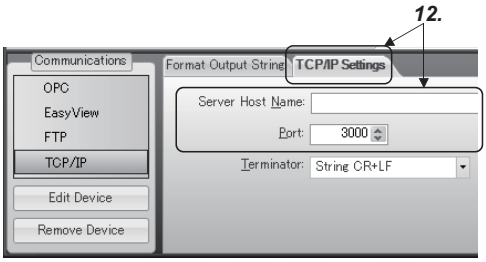
10. Set "Data Type" for the added data. Select "Integer", "Unsigned Integer" or "Floating Point". The data type stored in the Motion CPU device is always a 64-bit floating point type regardless of the data type set here.

11. Click [OK] button to close the FormatString dialog.



<Screen: In-Sight® Explorer>

12. Check the "TCP/IP Settings". Leave the Server Host Name blank. (The vision system acts as the TCP/IP server.) The port number must be the same as the port No. for TCP/IP communication set with the Ethernet communication line setting. (☞ Page 195 Ethernet Communication Line Setting)



<Screen: In-Sight® Explorer>

Flow of vision system control

This section explains the basic procedures for controlling the vision system from the Motion CPU.

Setting the vision system

Set the vision system network and create a job (vision program) using In-Sight® Explorer.

Setting the Motion CPU parameters

Set the Ethernet communication line setting and the vision program operation setting using MT Developer2. (☞ Page 195 Vision system parameter setting)

Controlling the vision system with vision system dedicated functions of Motion SFC

1. Log onto the control target vision system using the MVOPEN instruction.
2. Load the job (vision program) to be used using the MVLOAD instruction.
3. Issue a trigger to the vision system using the MVTRG instruction or vision system's image acquire trigger input. When the MVPST instruction is used, the job can be loaded and the trigger issued simultaneously.
4. When the vision system finishes executing the job, the job execution results are stored into the device set with the parameters (image data storage device and read value storage device) of Motion CPU.

In addition to the above procedure, data can be acquired from the vision system using the MVIN instruction or MC protocol. Select the method that suits the required data acquisition time or data type.

○: Enable, ×: Disable

Data acquisition method	Communication protocol	Data acquisition time	Output data type of vision system	Storage data type to the device	Batch acquisition of multiple data
Image data storage device	TCP/IP protocol	Fast ↑ ↓ Slow	Integer value	64-bit floating point type (Automatic conversion)	○
			Floating point value		
Read value storage device	Telnet		Integer value	32-bit integer type (Automatic conversion)	×
MVIN instruction	Telnet		Integer value	32-bit integer type (Automatic conversion)	×
			Floating point value	64-bit floating point type (Automatic conversion)	

5. Motion control is executed using the data acquired from the vision system.
6. Reset the status storage device using the MVFIN instruction to issue the next trigger.
7. If the job is not changed, repeat steps 3 to 6.
8. If necessary, log off the control target vision system using the MVCLOSE instruction.

Point

- If a different vision system dedicated function is executed for a vision system that is processing a vision system dedicated function, moderate error (error code: 38EDH) will occur. Apply the interlock conditions with the vision system's status storage device value to prevent double startup.
- Depending on the status of the vision system and details of the job process, it may take some time to process the vision system dedicated function. Set the timeout time according to the state.
- When logged onto the vision system, the vision system or Multiple CPU system's power supply can be turned OFF without logging off using the MVCLOSE instruction.

Sample program

Explanation of the operations

The following section gives an example of a program that executes positioning control using the adjustment data recognized by the vision system as the target data.

Setting the vision system

Complete the following settings with In-Sight® Explorer. Refer to the Cognex vision system manual or help sections for details on operating and setting In-Sight® Explorer.

■Ethernet communication setting

Item		Setting value
IP address		10.0.50.100
Port No.	Telnet	23
	TCP/IP	3000

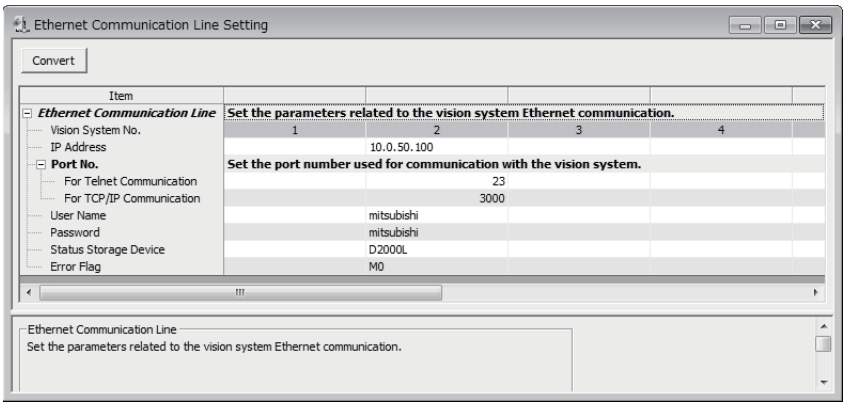
■Job setting

Item	Setting value		
Job name	Worksearch1		
TCP/IP protocol - Format output string	1	Pattern_1.fIXTURE.x	Floating point
	2	Pattern_1.fIXTURE.y	Floating point

Vision system parameter setting

Complete the vision system parameter setting of MT Developer2.

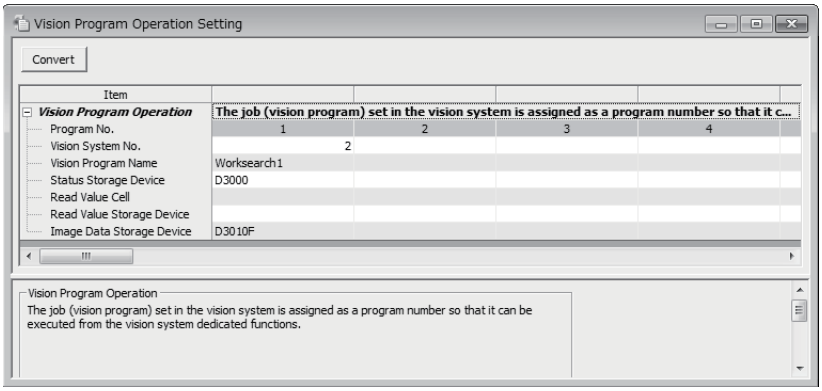
■Ethernet Communication Line Setting



• Vision System No.2

Setting item		Description
IP address		10.0.50.100
Port No.	Telnet	23
	TCP/IP	3000
User name		According to the vision system setting
Password		According to the vision system setting
Status storage device		D2000L
Error flag		M0

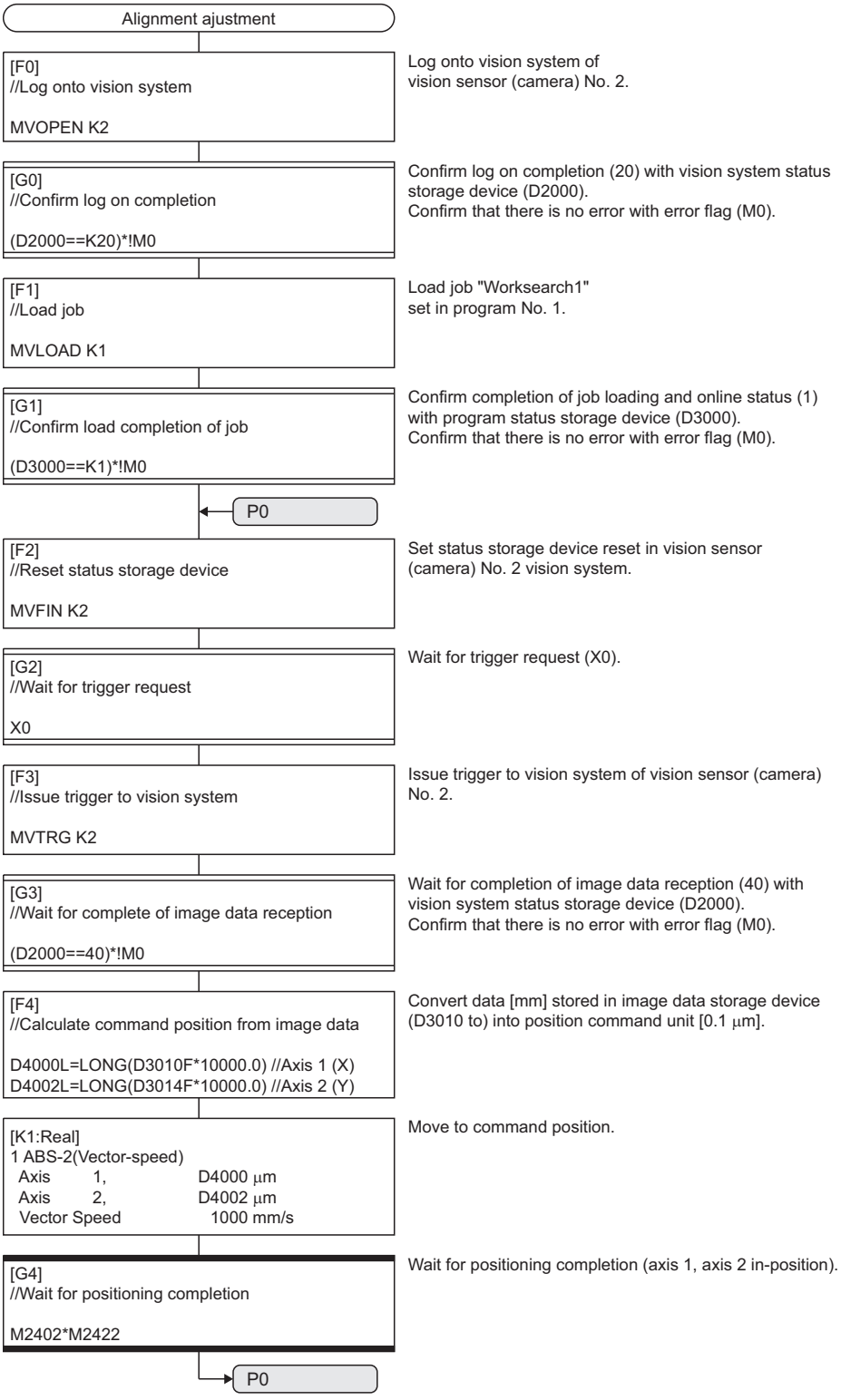
■Vision program operation setting


Vision Program Operation Setting
Convert
Item
Vision Program Operation
The job (vision program) set in the vision system is assigned as a program number so that it c...
Program No.
1
2
3
4
Vision System No.
2
Vision Program Name
Worksearch1
Status Storage Device
D3000
Read Value Cell
Read Value Storage Device
Image Data Storage Device
D3010F
Vision Program Operation
The job (vision program) set in the vision system is assigned as a program number so that it can be executed from the vision system dedicated functions.

• Program No.1

Setting item	Description
Vision system No.	2
Vision program name	Worksearch1
Status storage device	D3000
Read value cell	Not necessary to set
Read value storage device	
Image data storage device	D3010F

Motion SFC program


Alignment ajustment
[F0]
//Log onto vision system
MVOPEN K2
Log onto vision system of vision sensor (camera) No. 2.
[G0]
//Confirm log on completion
(D2000==K20)*!M0
Confirm log on completion (20) with vision system status storage device (D2000).
Confirm that there is no error with error flag (M0).
[F1]
//Load job
MVLOAD K1
Load job "Worksearch1" set in program No. 1.
[G1]
//Confirm load completion of job
(D3000==K1)*!M0
Confirm completion of job loading and online status (1) with program status storage device (D3000).
Confirm that there is no error with error flag (M0).
P0
[F2]
//Reset status storage device
MVFIN K2
Set status storage device reset in vision sensor (camera) No. 2 vision system.
[G2]
//Wait for trigger request
X0
Wait for trigger request (X0).
[F3]
//Issue trigger to vision system
MVTRG K2
Issue trigger to vision system of vision sensor (camera) No. 2.
[G3]
//Wait for complete of image data reception
(D2000==40)*!M0
Wait for completion of image data reception (40) with vision system status storage device (D2000).
Confirm that there is no error with error flag (M0).
[F4]
//Calculate command position from image data
D4000L=LONG(D3010F*10000.0) //Axis 1 (X)
D4002L=LONG(D3014F*10000.0) //Axis 2 (Y)
Convert data [mm] stored in image data storage device (D3010 to) into position command unit [0.1 μm].
[K1:Real]
1 ABS-2(Vector-speed)
Axis 1, D4000 μm
Axis 2, D4002 μm
Vector Speed 1000 mm/s
Move to command position.
[G4]
//Wait for positioning completion
M2402*M2422
Wait for positioning completion (axis 1, axis 2 in-position).
P0

6.6 Test Mode

In test mode, Motion CPUs are connected to a personal computer, and test operation is performed to verify whether servo motors are operating in accordance with design specifications. By starting the MT Developer2 test, a test mode request is issued to the Motion CPU. If the test mode request is successfully accepted, a test screen appears, allowing all test mode functions to be selected. Refer to the following for details on how to operate test mode.

Help of MT Developer2

The test mode operation differs depending on the operating system software and MT Developer2 version performing test mode.

The combinations for the operating system software and MT Developer2 version are shown below.

Motion CPU (R32MTCPU/R16MTCPU) operating system software	MELSOFT MT Works2 (MT Developer2)	Test mode operation
04 or later	1.115V or later	Multi-axis test operation
	1.112S or earlier	Single axis test operation
03 or earlier	1.112S or earlier	

Test mode specifications

The test mode specifications are shown below.

Function		Details	
		Multi-axis test operation	Single axis test operation
Operation axes selection		Select up to four axes for performing test operation.	Select one axis for performing test operation.
Operation axes servo ON/OFF	Servo ON	Servo ON the axes performing test operation. When a linear servo or DD motor are included in the operation axes, execute magnetic pole detection one axis at a time.	• All axes servo ON. • Each selected axis Servo ON.
	Servo OFF	Servo OFF the axes performing test operation.	• All axes servo OFF. • Each selected axis Servo OFF.
JOG operation		Perform JOG operation for up to four axes simultaneously.	Perform JOG operation for the specified axis.
Home position return		Perform home position return of the selected start axis.	Perform home position return for the specified axis.
Current value change		Perform current value change for up to four axes simultaneously.	Perform current value change for the specified axis.
Positioning operation		Perform positioning operation for up to four axes simultaneously.	Not available.
Stop		Stop request for axes in test operation.	
Rapid stop		Rapid stop request for axes in test operation.	
Error reset		Cancel error request, and reset the warning/error/servo alarm.	
Software stroke limit		Stroke limit check enabled/disabled can be selected when software stroke limit is valid.	Not available.
Hardware stroke limit		Stroke limit check enabled/disabled can be selected when FLS signal setting or RLS signal setting is valid.	Not available.

Differences between normal operation and test operation

The differences between normal operation and multi-axis test operation are shown below.

		Normal operation	Multi-axis test operation
JOG operation		JOG operation is executed based on the set values of JOG operation data and positioning dedicated signals.	JOG operation is executed based on the set values in JOG operation on the test screen.
Home position return	Proximity dog Dog cradle method	When home position return retry function is not set and home position return is performed again, a minor error (error code: 197BH) occurs, and home position reutrn is not performed.	Regardless of the home position retry function setting, home position return can be performed again after home position return completion.
	Stopper method Dogless home position signal reference method	If home position return is performed again after home position return completion, a minor error (error code: 197BH) occurs, and home position reutrn is not performed.	Home position return can be performed again after home position return completion.
Current value change		Current value change is executed based on the set values in the servo program.	Current value change is executed based on the set values in current value change on the test screen.
Positioning operation		Positioning operation is executed based on the set values in the servo program.	Positioning operation is executed based on the set values in positioning operation on the test screen.

Parameters used during test mode

During test mode, multi-axis test operation is performed using the parameters set in the test screen of MT Developer2.

Parameter settings

The parameters set for performing JOG operation and positioning operation are shown below.

Parameter		
JOG operation	Basic setting	JOG operation
		Acceleration time constant
		Deceleration time constant
		Rapid stop deceleration time constant
	Application setting	S-curve ratio
		Torque limit value
	Stroke limit valid/invalid setting	
Positioning control	Basic setting	Command speed
		Travel value
		Acceleration time constant
		Deceleration time constant
		Rapid stop deceleration time constant
	Application setting	S-curve ratio
		Torque limit value
	Stroke limit valid/invalid setting	
	Operation permission for home position return incompletion	

Point

- The set values of parameters other than those above (advanced S-curve acceleration/deceleration, deceleration processing on STOP input, allowable error range for circular interpolation, bias speed at start) are default values during test mode.
- When JOG operation or positioning operation is executed during test mode and the torque limit value of the test mode operation axis is changed, the torque limit value does not change back until it is reset by Motion SFC program, or Motion dedicated PLC instruction.

Test mode transition/cancellation

At a test mode transition request,initial processing is performed, and parameters and programs are read. Refer to initial processing for details of initial processing. (☞ Page 62 Initial processing)

Test mode transition

When transitioning to test mode all axes become servo OFF regardless of the servo ON/OFF status. ("[Rq.1123] All axes servo ON command (M2042)" and "[Rq.1155] Servo OFF command (M3215+20n)" turn ON.)
In the following cases, transition to test mode is not possible.

- "[Rq.1120] PLC ready flag (M2000)" turns ON.
- There is an axis in operation.
- An error occurred in the initial processing at test mode request transition.

Point

Note that at transition to test mode, all servo ON axes will change to servo OFF.

Test mode cancellation

To cancel test mode, request cancellation after stopping all axes. If there is an axis in operation, test mode cannot be cancelled. When test mode is cancelled the servo ON/OFF status of all axes ("[Rq.1123] All axes servo ON command (M2042)", "[Rq.1155] Servo OFF command (M3215+20n)") does not change from that of before cancellation.
To servo ON the servo OFF axes after test mode is cancelled, turn "[Rq.1155] Servo OFF command (M3215+20n)" from ON to OFF.

Stop processing of axes operating in test mode

When the following stop factors occur in an axis in test mode operation, stop processing is performed for all axes performing test operation. When performing test operation for multiple axes and a stop command or stop factor applies to one of the axes in test operation, stop processing is also performed for the axes in test mode operation that the stop command or stop factor does not apply to.

Stop factor	Stop processing
Stop signal input (STOP) external signal turned ON[*1]	Deceleration stop
Software stroke limit is reached[*2]	
Hardware stroke limit is reached[*1*3]	
"[Rq.1140] Stop command (M3200+20n) turned ON"[*1]	
"[Rq.1141] Rapid stop command (M3201+20n)" turned ON[*1]	Rapid stop
"[St.1068] Servo error detection (M2408+20n)" turned ON[*1*5]	
Stop from MT Developer2	Deceleration stop
Rapid stop from MT Developer2	Rapid stop
Communication with MT Developer2 is disconnected	Deceleration stop
CPU stop error[*4]	
Reset of multiple CPU system[*4*5]	Immediate stop
Motion CPU WDT error[*4*5]	
Multiple CPU system power supply OFF[*4*5]	
Motion CPU forced stop	
Servo amplifier forced stop[*5*6]	
Servo amplifier control circuit power supply OFF[*5*6]	

*1 During home position return, stop processing is not performed for axes where the stop factor has not occurred.
*2 When software stroke limit is set to "Disabled", a check of the stroke limit range is not performed.
*3 When hardware stroke limit is set to "Disabled", a check of the stroke limit range is not performed.
*4 Test mode is cancelled when a stop factor occurs.
*5 The servo motor is stopped by dynamic brake.
*6 A deceleration stop is performed on axes where the stop factor does not occur.

Point

When axes in test mode operation are servo OFF ([St.1075] Servo ready (M2415+20n): OFF) by the operation axis servo OFF in the test screen or when a servo error occurs, the "Ready ON (b0)" of "[Md.108] Servo status 1 (#8010+20n)" turns ON, and "Servo ON (b1)" turns OFF.

6.7 Positioning Control Monitor Function

Scroll monitor

The scroll monitor is a function used to monitor up to 256 items of positioning start history such as servo programs, JOG start, and Motion dedicated PLC instructions. This function applies to all control for which the start accept flag turns ON. Scroll monitor information is retained even when the Multiple CPU system power supply is turned OFF, or when reset. The scroll monitor is cleared by executing the scroll monitor [History clear] or "Motion CPU memory clear" from MT Developer2. The following items are displayed on the scroll monitor.

Item	Displayed content		Remarks
Date/time	Displays the date and time at which control was started.		Year/month/day hour:minute:second. 1/1000 second yyyy/MM/dd hh:mm:ss.ssss (1ms units)
Servo P. No.	Displays the control that was started.	K0 to K4095	Starts the servo program (K).
		JOG	Starts JOG operation.
		TEST	Starts the current value change or home position return in test mode.
		SCPU	Starts M(P).CHGA, D(P).CHGA, M(P).CHGAS, D(P).CHGAS, M(P).SVSTD, and D(P).SVSTD commands from the PLC.
		Sync	Starts advanced synchronous control.
		□->□ *: □ represents the following. P: Positioning control mode V: Speed control mode T: Torque control mode CT: Continuous operation to torque control mode	Control mode switching
		PRS	Starts pressure control
Axis No.	Displays the axis No. to be started.		
Servo program instruction	Displays the started servo program command.		• In the case of simultaneous start commands, the number of the servo program to be started is displayed. (Individual servo programs to be started are not registered in the scroll monitor.) • Remains blank for JOG start, synchronous control start, and control mode switching.

Current value history monitor

The current value history monitor is a function used to monitor the encoder position data history for each axis. Current position data, home position return data, and Multiple CPU system power supply ON/OFF data (for past 10 times) can be monitored. Current value history monitor information is always stored, regardless of whether the system is absolute or incremental, and is retained even when the Multiple CPU system power supply is turned OFF, or when reset. The current value history monitor is cleared when performing a "Motion CPU memory clear" from MT Developer2, or when clearing the built-in memory with the rotary switch. The following items are displayed on the current value history monitor.

Display item	Displayed content	Remarks
Item	Displays current value history items. • Home position data: Current value when home position return is completed normally. • Monitor value: Current real-time current value*1 • Power supply ON: Current value when servo amplifier initial communication established*1*2 • Power supply OFF: Current value when communication with servo amplifier disconnected*1*2*3	
Date/time	Displays the date and time at which current value history was recorded.	Year/month/day hour:minute:second. 1/1000 second yyyy/MM/dd hh:mm:ss.ssss (1ms units)
Encoder current value	Displays the motor encoder multiple revolution counter and position within a single revolution.	Decimal notation
Servo command value	Displays the positioning command value sent to the servo amplifier.	Decimal notation
Monitor current value	Displays the current value managed inside the Motion CPU.*4	Decimal notation
Error code	Displays the error code if an error relating to current value restoration occurs when the servo amplifier power supply is turned ON.	Warning (error code: 093CH, 093FH)

*1 History is not updated if a servo amplifier AL.16 error (encoder initial communication error 1) has occurred at an absolute position system.

*2 "Power supply ON" displays the date and time at which initial communication was established with the servo amplifier, and "Power supply OFF" displays the date and time at which communication with the servo amplifier was disconnected. Consequently, a single item of history is recorded even when communication is interrupted or resumed with the SSCNET connect/disconnect function when the servo amplifier control power supply and Multiple CPU system power supply are ON.

*3 The "Power supply OFF" history is updated at the same time as the "Power supply ON" history when the power supply is subsequently turned ON (when initial communication established with servo amplifier).

*4 A value close to the feed current value is displayed, however, the monitor current value and feed current value are different, and therefore it is not abnormal for a different value to appear.

Speed monitor

By selecting "Target speed" for the display item at the MT Developer2 axis monitor screen, the command speed (displayed in axis control units) specified with the program currently being used for positioning control can be monitored. Successive command speed [pulse/s] can be monitored with "[Md.28] Command speed (#8004+20n, #8005+20n)". The following table shows whether the monitor speed can be displayed for each type of control.

○: Display possible, ×: Display not possible, or not possible to update the display

Control details	Target speed	[Md.28] Command speed (#8004+20n, #8005+20n)
PTP (point to point) control	○*1	○
Fixed-pitch feed	○	
Speed control (I)	○	
Speed control (II)	○	
Speed/position switching control	○	
Continuous trajectory control	○*2	
Fixed-pitch feed control	○	
Speed control with fixed position stop	○	
JOG operation	○	
Manual pulse generator operation	×	
Home position return	○	
High-speed oscillation	×	
Synchronous control output axis	×	
Speed change (CHGV command, M(P).CHGV command, D(P).CHGV command)	○*3	
Speed-torque control	×	○*4

*1 The speed (vector speed, reference axis speed, long-axis speed) specified in the program is displayed while executing interpolation instructions. The same value displays for each axis.

*2 The speed specified at a midway point in continuous trajectory control is updated as the monitor screen command speed when analysing point data. Point data analysis is carried out prior to point switching, and therefore the monitor screen command speed is updated prior to point switching.

*3 If the speed specified at speed change exceeds the speed limit value, the actual command speed limited by the speed limit value is displayed.

*4 The speed limit value is stored during torque control.

Point

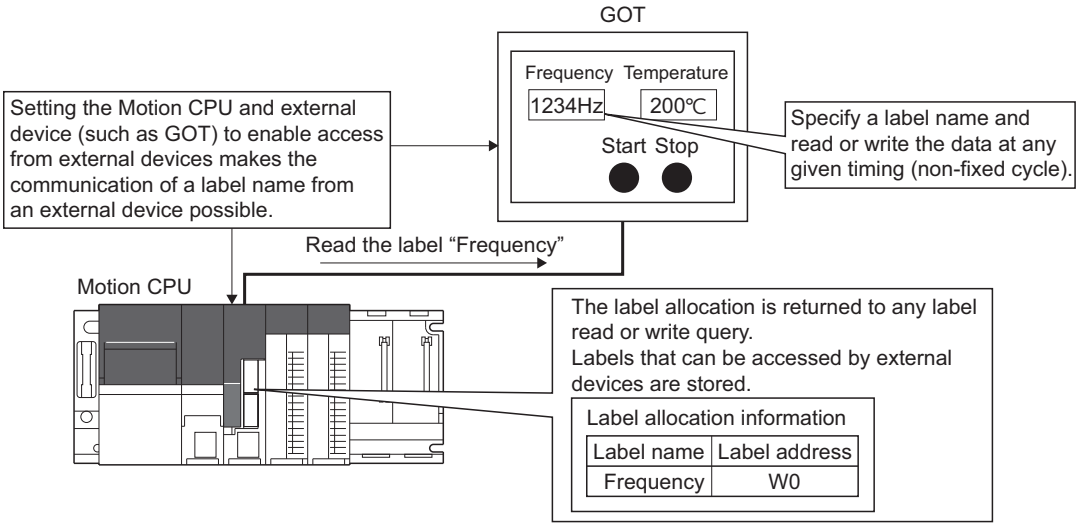
The "[Md.28] Command speed (#8004+20n, #8005+20n)" is calculated based on the amount of change in the position command (pulse units) sent to the servo amplifier each operation cycle. Consequently, there are times when the displayed speed for each operation cycle varies due to speed conversion fraction processing.

6.8 Label Access from External Devices

Communication from an external device such as a graphic operation terminal (GOT) to the Motion CPU is possible by specifying label names.

The external device accesses labels by specifying label names in the label allocation information stored in the Motion CPU. Label allocation information defines the label names and data types, as well as where each label is allocated.

This makes it possible for external devices to communicate with the Motion CPU by specifying label names, without having to remember the addresses allocated to each label.

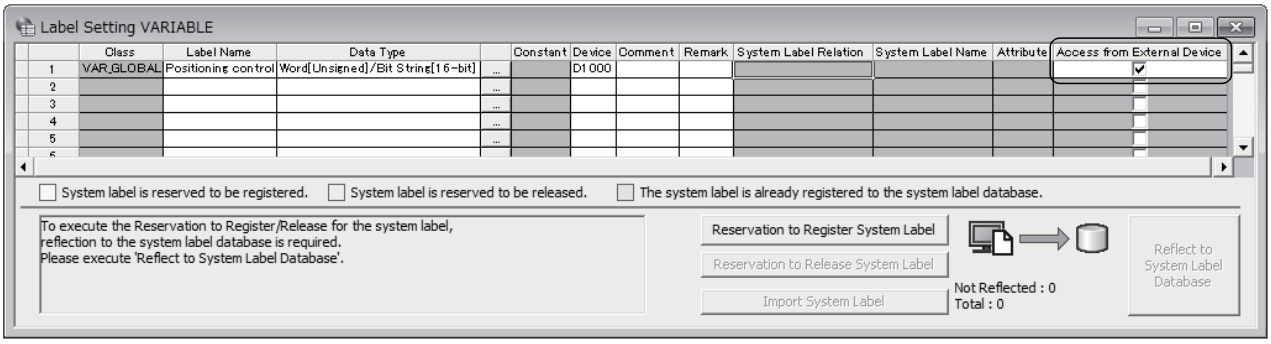

GOT
Frequency Temperature
1234Hz
200℃
Start Stop
Setting the Motion CPU and external device (such as GOT) to enable access from external devices makes the communication of a label name from an external device possible.
Specify a label name and read or write the data at any given timing (non-fixed cycle).
Read the label “Frequency”
Motion CPU
The label allocation is returned to any label read or write query.
Labels that can be accessed by external devices are stored.
Label allocation information
Label name
Label address
Frequency
W0

Setting Labels

Set the label to be accessed from an external device in label setting, and check "Access from external device".

Refer to the following for the operation procedures of label setting.

Help of MT Developer2



When label allocation is changed

When a device with a label allocated in the label setting is changed, the Motion CPU follows up by automatically making the external device refer to the changed device, therefore changing the label settings at the external device is not required.

However, when data type etc. is changed, an update at the external device is required.

The actions at the external device when a label is changed are shown below.

Change at the Motion CPU	Change at the external device	Remarks
Changed device allocated to label	Change at external device not required	—
Changed the data type of the label	Change at external device required	Change the data type changed at the Motion CPU at the external device.
Deleted the label		Correct the label deleted at the Motion CPU at the external device.

Storing label allocation information

The label allocation information used when accessing labels from external devices is stored in the standard ROM or the SD memory card. When using label allocation information stored in the SD memory card (storing label allocation information in the SD memory card), set the transfer for "label allocation information" in the SD memory card with the file transmission at boot function.

Refer to file transmission at boot function for details on file transmission at boot function. (☞ Page 107 File Transmission at Boot Function)

Not using file transmission at boot	Using file transmission at boot (specify label/structure file control data)	
	Specifying the standard ROM	Specifying the SD memory card
Standard ROM	Standard ROM	SD memory card

■Description example for operation file at boot

- When using the label allocation information stored in the SD memory card (label/structure file (GL_LABEL.IF2))

```
/GL_LABEL.IF2, /sdc, , pathset
```

- When using the label allocation information stored in the standard ROM (label/structure file (GL_LABEL.IF2)) (initial status)

```
/GL_LABEL.IF2, /rom, , pathset
```

7 DIGITAL OSCILLOSCOPE

7.1 Features

Analysis is possible with high-accuracy sampling.

Sampling is possible in cycles as short as 0.222ms. Sampling is performed without missing specified control data changes. By reading the sampling result with the MT Developer2 digital oscilloscope and outputting to a waveform, the identification of system startup and the cause of trouble can be analyzed with high accuracy.

Offline sampling is possible with the personal computer.

By writing a setting data file necessary for sampling to the Motion CPU standard ROM or to an SD memory card beforehand, sampling can even be performed offline. This allows sampling to be performed even in environments where there is no personal computer or where the cable connected to the personal computer is damaged. Furthermore, sampling results output and saved to a specified location can be checked and analysed directly without using the MT Developer2 digital oscilloscope.

7.2 Function Overview

With the digital oscilloscope function, data can be sampled in specified cycles, and sampling results can be saved to the standard ROM or to an SD memory card.

7.3 Digital Oscilloscope Specifications

The digital oscilloscope specifications are shown in the following table.

Individual sampling setting specifications

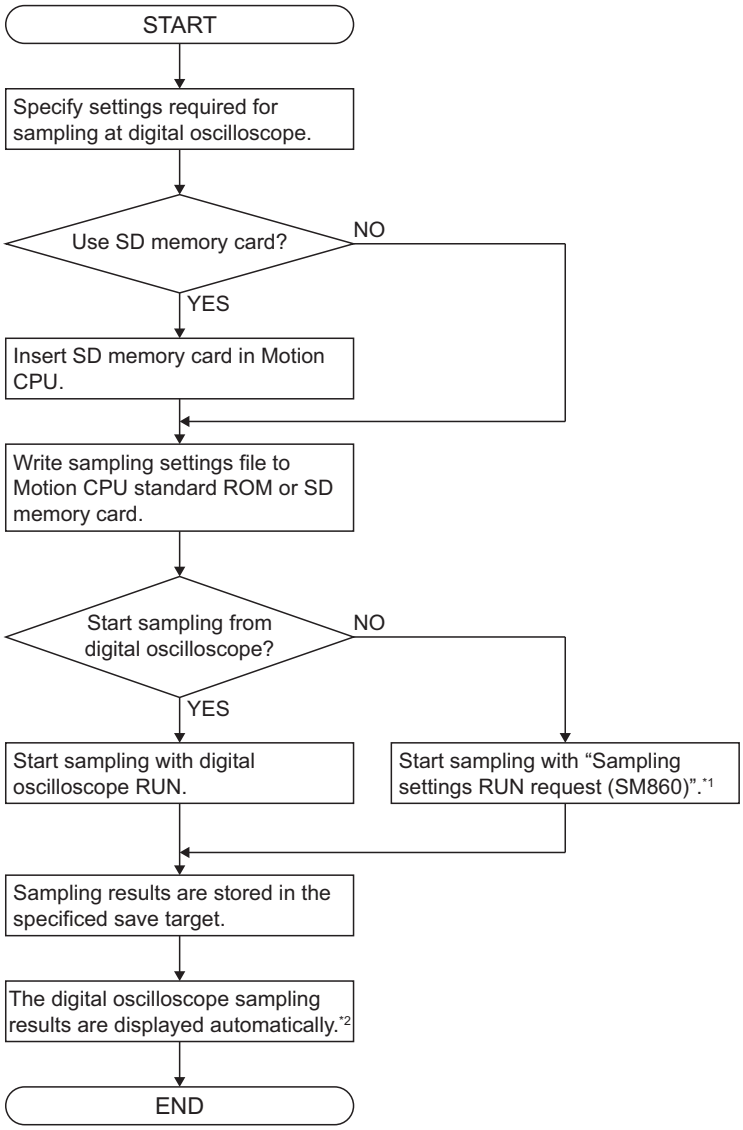
Function			R32MTCPU/R16MTCPU
Sampling settings data storage target			Standard ROM, SD memory card
Sampling type			Trigger sampling
Sampling start setting			User operation
Sampling interval			Operation cycle, 0.222ms × sampling rate interval
No. of channels	Word data		Up to 16 channels
	Bit data		Up to 16 channels
Word size	2 bytes		With sign/Without sign
	4 bytes		With sign/Without sign
Sampling target	Word data	Servo control data	Selected from probe item list.
		Motion dedicated device	
		Advanced synchronous control device	
		Optional device	Word device*1
	Bit data	Motion dedicated device	Selected from probe item list.
		Advanced synchronous control device	
		Optional device	Bit device*1
Trigger	Number of sampling points		Up to 133120 points (default: 8192 points)
	Trigger mode	No trigger	—
		Data conditions	OR condition, AND condition
	Setting when trigger mode is data conditions	Trigger pattern (bit)	No setting, OFF, ON, OFF → ON (leading edge), ON → OFF (trailing edge)
		Trigger pattern (word)	No setting, increase direction, decrease direction, increase or decrease direction
		Trigger reference value (word trigger only)	Specified in data type range for each channel.
		Filter specification	0 to 10000 (× rate ms)
Saving	Sampling results save destination		Standard ROM, SD memory card
	File format		CSV
Real-time display	Channels capable of real-time display	Word	Up to 8 channels
		Bit	Up to 8 channels

*1 Refer to device list for the range of devices that can be set. (☞ Page 66 Device List)

7.4 Digital Oscilloscope Operating Procedure

The digital oscilloscope sampling operating procedure is described below. The digital oscilloscope is operated using MT Developer2. Set clock data before using the digital oscilloscope. File name time information is created based on the clock data setting. (☞ Page 102 Clock Function)

Furthermore, if using an SD memory card, the card must be formatted. (☞ Page 231 SD memory card handling)


START
Specify settings required for sampling at digital oscilloscope.
Use SD memory card?
NO
YES
Insert SD memory card in Motion CPU.
Write sampling settings file to Motion CPU standard ROM or SD memory card.
Start sampling from digital oscilloscope?
NO
YES
Start sampling with digital oscilloscope RUN.
Start sampling with "Sampling settings RUN request (SM860)".*1
Sampling results are stored in the specificed save target.
The digital oscilloscope sampling results are displayed automatically.*2
END

*1 Operation is possible even if not connected to the digital oscilloscope.

*2 Sampling results are displayed automatically, however, sampling results files can also be read later.

7.5 Sampling Settings File

The sampling settings file is a file used to set information required for sampling such as the sampling interval and probe data. The sampling settings file is saved to the standard ROM or to an SD memory card. Sampling is started by specifying the sampling settings file storage target. The sampling settings file setting items are as follows.

File type	Setting item
Sampling settings file	Sampling interval
	Sampling target
	Trigger settings
	Save settings

7.6 Sampling Functions

The functions used to perform sampling with the digital oscilloscope are as follows.

Sampling type

The sampling type sets the sampling method.

Trigger sampling

Values before and after the trigger (when specified conditions established) are sampled only in the specified range. Sampling is complete when saving to the specified save destination is complete.

Sampling start settings

Sampling start settings specify conditions required to start sampling with the digital oscilloscope.

User operation

Sampling of the sampling settings file stored in the standard ROM or SD memory card is started with a digital oscilloscope RUN output, or when the "Sampling settings RUN request (SM860)" turns from OFF to ON.

■RUN from digital oscilloscope

The sampling settings file is specified, and sampling is started with digital oscilloscope RUN. Sampling can be stopped with digital oscilloscope STOP during sampling.

■"Sampling settings RUN request (SM860)" OFF → ON

"Sampling settings storage target (SD860)" is specified, and sampling is started when "Sampling settings RUN request (SM860)" is turned ON. Furthermore, sampling is stopped by turning the "Sampling settings RUN request (SM860)" OFF. Sampling can be performed even when not connected to the personal computer.

Digital oscilloscope request device

Setting item	Setting details	Setting value	Fetch cycle	Device No.
Sampling settings RUN request	Requests sampling. By setting the "Sampling settings storage target" and turning ON the RUN request, sampling is started. Sampling is stopped by turning OFF the request during sampling. This device does not change even when sampling is complete. The RUN request is ignored even if the device is turned from OFF to ON while the "Sampling settings RUN status" is ON.	ON: RUN OFF: STOP	Main cycle	SM860

Digital oscilloscope setting device

Setting item	Setting details	Setting value	Fetch cycle	Device No.
Sampling settings storage target	Set the storage target drive for sampling settings data subject to sampling. Read when the "Sampling setting RUN request" is ON.	0: Standard ROM 1: SD memory card	When "Sampling setting RUN request" is ON	SD860

Sampling interval

Set the interval condition for sampling with the digital oscilloscope.

Operation cycle

Sampling is always performed in the operation cycle interval.

Sampling rate specification

Sampling is performed in "0.222ms × sampling rate interval".

Sampling rate range
1 to 10000

Sampling target

The probe item to be sampled with the digital oscilloscope is set in the probe settings. 16 channels can be set for probe items in word data, and 16 channels can be set for bit data for each sampling settings file. The following data is set in the probe settings.

Type		Range
Word data	Servo control data	Selected from probe item list.
	Motion dedicated device	
	Advanced synchronous control device	
	Optional device	Word device*1
Word data size		2 bytes (with sign/without sign), 4 bytes (with sign/without sign)
Bit data	Motion dedicated device	Selected from probe item list.
	Advanced synchronous control device	
	Optional device	Bit device*1

*1 Refer to device list for the range of devices that can be set. (☞ Page 66 Device List)

Trigger settings

Trigger condition settings

Trigger conditions are set to turn ON the trigger. The following items are set in the trigger condition settings.

■Data conditions

- Trigger mode setting

  Select the conditions used to turn ON the trigger with trigger conditions set for each channel.

  The establishment of trigger conditions set for each channel is judged with either the OR condition or AND condition. OR and AND conditions cannot be combined and used for each channel.

Condition	Details
OR condition	The trigger turns ON if any of the conditions for each channel data are established.
AND condition	The trigger turns ON if all of the conditions for each channel data are established.

- Trigger conditions

  Trigger conditions are set for each channel. The number of channels for which trigger conditions are set is 16 channels in word data, and 16 channels in bit data. (for number of probe settings)

  (1) Bit trigger pattern

Pattern	Details
No setting	—
ON	When the channel value is ON
OFF	When the channel value is OFF
↑	When the channel value changes from OFF to ON
↓	When the channel value changes from ON to OFF

  (2) Word trigger pattern

  These are the conditions when compared with the value specified for the trigger reference value (trigger value).

Pattern	Details
Increase direction	When the channel value changes from a value smaller than the trigger value to the trigger value or greater
Decrease direction	When the channel value changes from a value greater than the trigger value to the trigger value or smaller
Increase or decrease direction	When the channel value changes from a value smaller than the trigger value to the trigger value or greater, or from a value greater than the trigger value to the trigger value or smaller

- Trigger reference value

  The trigger reference value (trigger value) set with a word trigger sets the range corresponding to the size of each word data.

Word size		Lower limit	Upper limit
2 bytes	Without sign	0	65535
	With sign	-32768	32767
4 bytes	Without sign	0	4294967295
	With sign	-2147483648	2147483647

- Filter specification

  The trigger point is set as the point after time elapsed of the sampling interval × filter specification value after the trigger turns ON. The filter specification can be set for each channel.

Filter setting range
1 to 10000

■No trigger condition settings

No trigger conditions are set. Sampling can be completed with a STOP output during sampling.

Sampling points

The number of sampling points that can be set when specifying trigger condition settings is as follows. By increasing the sampling points, the sampling results file size and time taken to output the results to the save destination increase, and therefore caution is advised.

■Trigger sampling

- Sampling results save destination

Save destination	Save volume
Standard ROM	10 to 8192 points (default: 8192 points)
SD memory card	10 to 133120 points (default: 8192 points)

■Sampling points before trigger

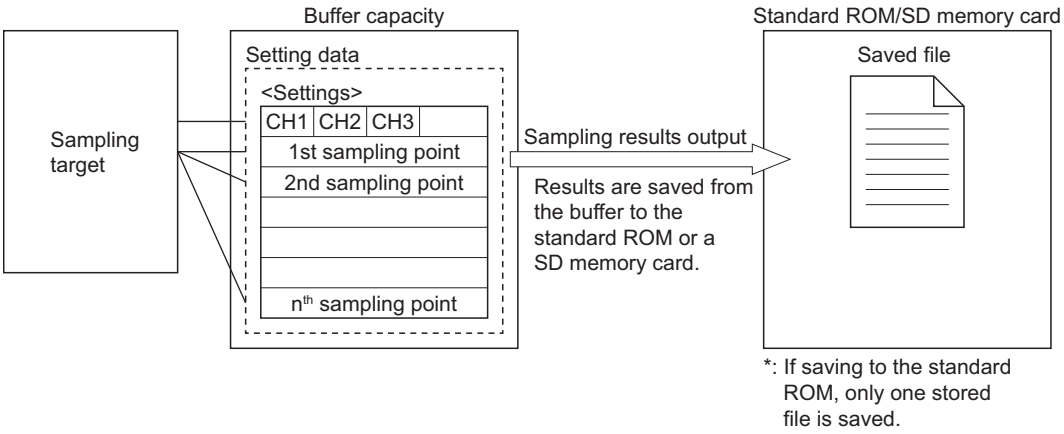
0 to sampling points -1 (default: sampling points/2)

■Sampling points after trigger

1 to sampling points - sampling points before trigger

Saving sampling results

Data sampled with the digital oscilloscope is stored in the Motion CPU internal memory, and when sampling is complete, sampling results are saved to the standard ROM or to an SD memory card.


Buffer capacity
Standard ROM/SD memory card
Sampling target
Setting data
<Settings>
CH1 CH2 CH3
1st sampling point
2nd sampling point
nth sampling point
Sampling results output
Results are saved from the buffer to the standard ROM or a SD memory card.
Saved file
*: If saving to the standard ROM, only one stored file is saved.

Sampling results save destination

The sampling results save destination is specified from the following.

"Standard ROM" cannot be specified if the save destination for the sampling settings file is SD memory card.

Sampling settings file save destination	Settable save destination
Standard ROM	• Standard ROM (trigger sampling only) • SD memory card
SD memory card	• SD memory card

Save destination folder and file name

Sampling results are stored to a sampling results output folder in the specified save destination (standard ROM or SD memory card), and the system time (hexadecimal notation) is output as the file name in 8 digits when outputting sampling results.

Save destination folder	Save file name (system time *1)
\data\oscout**	********.csv

*1 Elapsed time (seconds) up to the current time using Greenwich Mean Time 00:00, January 1st 1970 as the reference.

7.7 Digital Oscilloscope Status

The digital oscilloscope status can be checked at the digital oscilloscope monitor.

Digital oscilloscope monitor data

■Bit device

Monitor item	Stored content	Monitor value	Refresh cycle	Device No.
Sampling settings RUN status	Turns ON when sampling is started. Turns OFF when saving of the sampling results is complete.	OFF: STOP ON: RUN	When sampling status changes (main cycle)	SM760
Sampling settings trigger status	Turns ON when trigger conditions are established. Remains ON even when sampling is complete, and turns OFF when starting sampling.	OFF: before trigger ON: after trigger	When trigger ON (sampling cycle)	SM761
Sampling settings saving	Turns ON while saving data in the buffer data to the storage target when performing sampling.	OFF: Not while saving ON: While saving	When file save status changes (main cycle)	SM762

■Word device

Monitor item	Stored content	Monitor value	Refresh cycle	Device No.
Sampling settings storage target	The storage target for the sampling settings file being sampled is stored.	0: No sampling 1: Standard ROM 2: SD memory card	When starting sampling (main cycle)	SD760
Sample settings results save target	The sampling results save destination for the data being sampled is stored.	0: No sampling 1: Standard ROM 2: SD memory card		SD761
Sampling settings sampling type	The sampling type being sampled is stored.	0: No sampling 1: Trigger sampling		SD762
Sampling settings sampling results Latest file information	The latest sampling results file information (system time *1) is stored.	Latest saved file information	When outputting sampling results (main cycle)	SD764, SD765

*1 Elapsed time (seconds) up to the current time using Greenwich Mean Time 00:00, January 1st 1970 as the reference can be checked.

7.8 Digital Oscilloscope Errors

When digital oscilloscope errors occur

If an error occurs at the digital oscilloscope, the error detection special relay turns ON, the error code is stored in a special register, and this appears in the event history. The error is not displayed in the error history. Furthermore, if a self-diagnosis error has occurred, sampling will not be possible. (The cause of this error is also not detected.)

■Bit device

Monitor item	Stored content	Monitor value	Refresh cycle	Device No.
Sampling setting Sampling error	Turns ON when sampling error occurs. Turns OFF when the next sampling is started.	OFF: No error ON: Error	Main cycle	SM765

■Word device

Monitor item	Stored content	Monitor value	Refresh cycle	Device No.
Sampling setting digital oscilloscope error cause	The error code for the sampling error is stored. This is cleared to 0 when the next sampling is performed.	0: No error Other than 0: Error code	Main cycle	SD769

Digital oscilloscope error list

The following table shows the details and cause of errors occurring at the digital oscilloscope, and the corrective action for those errors.

Error code	Error name	Error details and cause	Corrective action
0032H	Outside settings data storage range	A value outside the setting range for the "Sampling settings storage target" was set when "Sampling setting RUN request" is ON.	Set the "Sampling settings storage target" inside the range.
0033H	Settings file write error	No settings file exists.	Write the settings file again from the digital oscilloscope.
0034H	SD card unusable	Sampling was started with no SD memory card inserted, or with use of the SD memory card forcibly stopped.	• Check whether the SD memory card has been inserted. • If use of the SD memory card has been forcibly stopped, release the stop.
0035H	SD memory card writing not possible	The SD memory card is write protected.	Release the SD memory card write protect.
0064H	Settings file error	There is an error in the settings file.	Write the settings file again from the digital oscilloscope.
0065H	Settings file version not supported	The settings file version is not supported.	Check the versions compatible with the digital oscilloscope, and write the settings file again.
0096H	Sampling results output error	The specified drive (memory) capacity or folder/file configuration is wrong, and therefore it was not possible to complete sampling results output.	Delete any unnecessary files, and secure sufficient memory space.

8 MOTION CPU MEMORY STRUCTURE

Programs and parameters used for Motion CPU control are stored as files in a nonvolatile memory "standard ROM" built in to the Motion CPU, or a "SD memory card" installed in the SD memory card slot of the Motion CPU.
The SD memory card can be removed from the Motion CPU and used with peripheral equipment such as personal computers, facilitating flexible data management.
Furthermore, by saving the system operating system software in a predetermined folder beforehand, it can be installed in the Motion CPU.

8.1 Memory and Files

Standard ROM/SD memory card specifications

The Motion CPU standard ROM and SD memory card specifications are as follows.

Item	Standard ROM	SD memory card
Memory capacity*1	12288kbytes	SD memory card capacity (Up to 32Gbytes)
Formatting prior to initial use	Not required*2	Required*3
Formatting method	• MT Developer2 "Motion CPU memory format" • Initialization with rotary switch	MT Developer2 "Motion CPU memory format"

*1 Total capacity including file management area. The capacity excluding the file management area is smaller. Free memory space can be checked with MT Developer2.
*2 Formatting is completed prior to shipping.
*3 Format SD memory cards with MT Developer2. If formatted with the Windows formatting function or with a device other than a Motion CPU module (PLC, etc.), it will not be possible to use SD memory cards by inserting them into the Motion CPU module.

Available operations

The following operations can be performed for standard ROM and SD memory cards.

Operation			Standard ROM	SD memory card
Motion CPU initialization with rotary switch*1			○	—
MT Developer2	Memory formatting*1		○	○
	CPU writing/reading	Writing	○	○
		Reading	○	○
		Deletion	○	○
	Digital oscilloscope	Writing	○	○
		Reading	○	○
		Deletion	○	○
File transmission at boot		Writing	○	○
		Reading	○	○
		Deletion	○	○
Motion SFC program cam data operation instructions (CAMRD/CAMWR/CAMMK)		Writing	○	○
		Reading	○	○

*1 Refer to memory initialization for details. (☞ Page 233 Memory Initialization)

Point

- SD memory cards cannot be used if write protected.
- Read-only files cannot be written to or deleted.
- The file update date and creation date is based on the No.1 PLC CPU clock data.

File handling precautions

File reading and file writing processing

File reading and writing processes are performed in the Motion CPU main cycle. The read and write time varies depending on the file size and main cycle length.

Power supply OFF (including reset) when performing file operations

File content is not assured if the Multiple CPU system power supply is turned OFF or the system is reset when performing file operations other than data reading. In order to avoid file corruption, turn OFF the Multiple CPU system power supply or reset the system after completing file operation.

Simultaneous access of the same file

An error occurs when performing the following operations. Ensure that MT Developer2 processing is complete before moving onto subsequent processing.

- The file currently being written is accessed (read/written to) from another MT Developer2.
- The file currently being accessed (read/written to) is written to from another MT Developer2.

Simultaneous access to different files from multiple MT Developer2 applications

Up to 16 different files for the same CPU module can be simultaneously accessed from another MT Developer2.

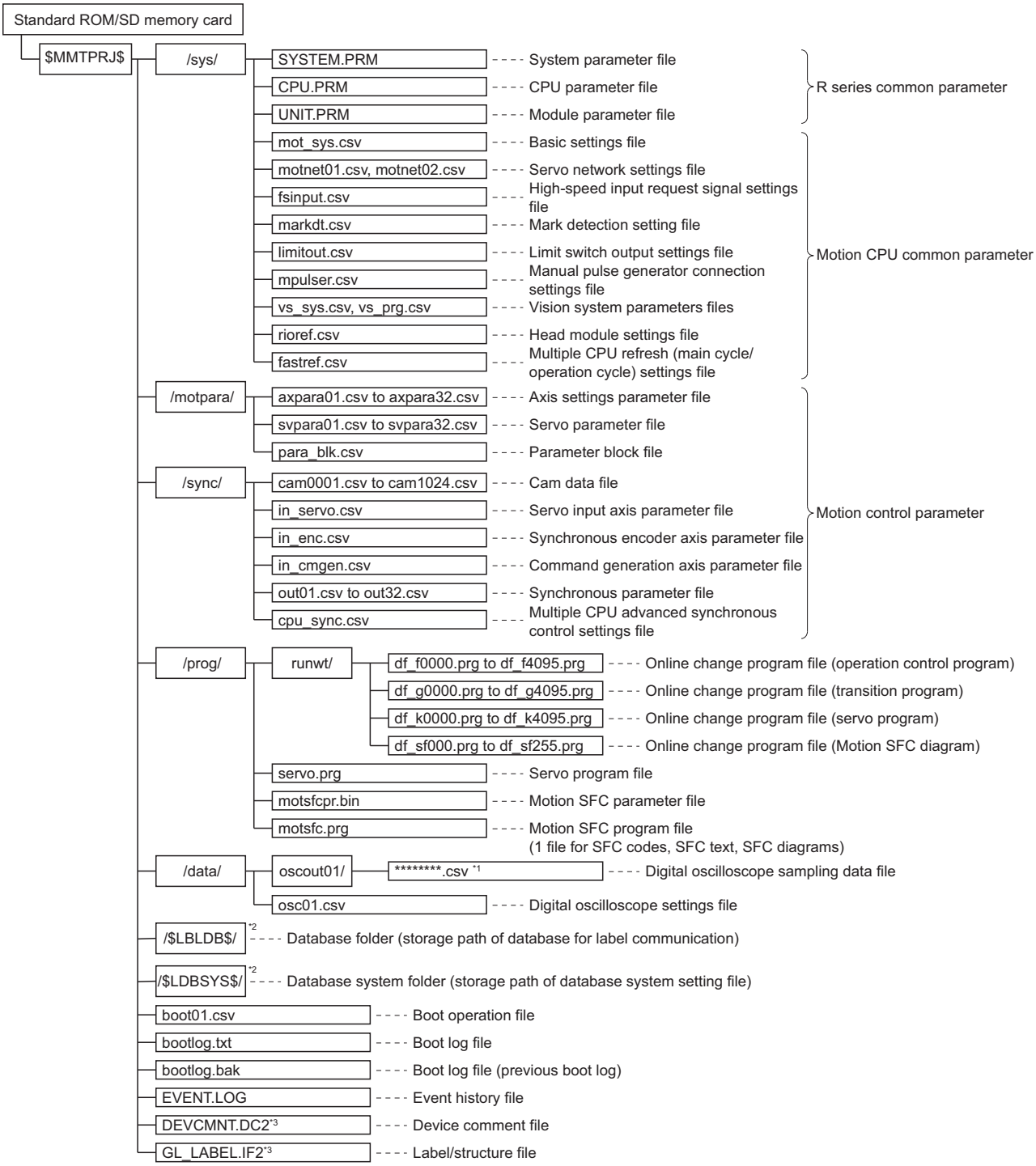
Stored files

Programs and parameters used for Motion CPU control are stored inside a "$MMTPRJ$" folder created in a root folder in the standard ROM or SD memory card. The "$MMTPRJ$" folder is automatically created at the following times.

- When the "$MMTPRJ$" folder does not exist when turning ON the Multiple CPU system power supply.
- When the SD memory card is formatted.

The following files are stored in the "$MMTPRJ$" folder.

Stored files



*1: Elapsed time (seconds) up to the current time using Greenwich Mean Time 00:00, January 1st 1970 as the reference (hexadecimal notation)

*2: Created when “Access from external device” is set in label setting of MT Developer2. Do not change the files in the folder.

*3: For operating system software version “02” or earlier, the file names are DEVCMNT.IFG (device comment file), and GL_LABEL.DCM (label/structure file).

Point

If the files required by the Motion CPU do not exist in the folder, a moderate error (error code: 2200H) occurs, and the Motion CPU does not RUN.

8.2 SD Memory Card

This section describes functions using a SD memory card.

SD memory card handling

- Formatting is required for all SD memory cards used with the Motion CPU module. Purchased SD memory cards will not have been formatted, and should therefore be used after inserting them in the Motion CPU module and formatting with the MT Developer2 [Online] → [Motion CPU memory format] → [SD memory card format]. Do not format SD memory cards at the personal computer.
- Data contained in SD memory cards may be corrupted if the power supply is turned OFF, the system is reset, or the SD memory card is removed while the card is being accessed. If the CARD ACCESS LED is ON, always stop access to the SD memory card with the SD memory card access control switch before turning OFF the power supply, resetting, or removing the SD memory card. Please note that batch stopping is possible for all SD memory cards being used, and the use stop status can be checked with "SD memory card forced disable instruction (SM606)" and "SD memory card forced disable state flag (SM607)".

SD memory card forced stop

Even if the Motion CPU module is performing functions that use a SD memory card, SD memory cards can easily be removed without turning OFF the Multiple CPU system power supply to stop use of the SD memory card.

SD memory card forced stop method

Forced stop of SD memory cards is performed using the following procedure.

■Operation with SD memory card access control switch

1. Press the Motion CPU module SD memory card access control switch for 1 second or longer.
2. The CARD READY LED flickers.*1
3. Check that the CARD READY LED is OFF.
4. Remove the SD memory card.

*1 If there are functions that are currently accessing the SD memory card, the CARD READY LED turns OFF after access with that function is complete, and so depending on the function, the time taken for the LED status to change from flickering to OFF will differ.

■Operation with special relay

1. Turn "SD memory card forced disable instruction (SM606)" ON.
2. Ensure that the CARD READY LED is OFF, or that "SD memory card forced disable state flag (SM607)" is ON.
3. Remove the SD memory card.

Cancelling the SD memory card use stop status

The SD memory card use stop status can be cancelled using the following procedure.

- Reinsert the SD memory card. (CARD READY LED changes from flickering to ON.)
- Reboot the Multiple CPU system power supply, or reset the system.

SD memory card forced stop precautions

- If use of the SD memory card is forcibly stopped with the SD memory card access control switch and also with the "SD memory card forced disable instruction (SM606)", the operation executed first will be valid, and the subsequent operation will be invalid. For example, if the "SD memory card forced disable instruction (SM606)" is turned from ON to OFF without removing the card after forced stop with the SD memory card access control switch, the use stop status can be cancelled. If the SD memory card is removed after forced stop with the SD memory card access control switch, and then the "SD memory card forced disable instruction (SM606)" is turned ON, the "SD memory card forced disable instruction request (SM606)" operation will be ignored.
- If the SD memory card is forcibly stopped while writing a file to the SD memory card from an external device, file writing may fail. Write the file again after cancelling the SD memory card use stop status.

8.3 Memory Initialization

The following methods can be used to delete (initialization) data on Motion CPU standard ROM, backup RAM, and SD memory cards.

Supported function			Initialization target					
			Files		Backup data	Device		
						Latch (1)	Latch (2)	Other than latch
			Standard ROM	SD memory card	Backup RAM			
MT Developer2	Motion CPU memory clear*1	Latch (1) zero clear	—	—	—	○	—	—
		Zero clear for other than latch (1)/latch (2)	—	—	—	—	—	○
	Motion CPU memory formatting*1	Standard ROM formatting	○	—	—	—	—	—
		SD memory card formatting	—	○	—	—	—	—
Motion CPU initialization with rotary switch*2		Standard ROM and backup RAM	○	—	○	○	○	○
		Backup RAM	—	—	○	○	○	○
		Standard ROM	○	—	—	—	—	—

*1 Executed during STOP. Cannot be performed in installation mode.

*2 Executed with built-in memory clear (rotary switch set to "C"). Refer to the following for details.
MELSEC iQ-R Motion Controller User's Manual

Point

- Backup data includes the servo parameter open area, absolute position data, current value history data, scroll monitor information, and synchronous control backup data.
- The system operating system software is not deleted even when initializing data.
- Refer to the following for details on MT Developer2 operation.
Help of MT Developer2

8.4 Installing the Operating System Software

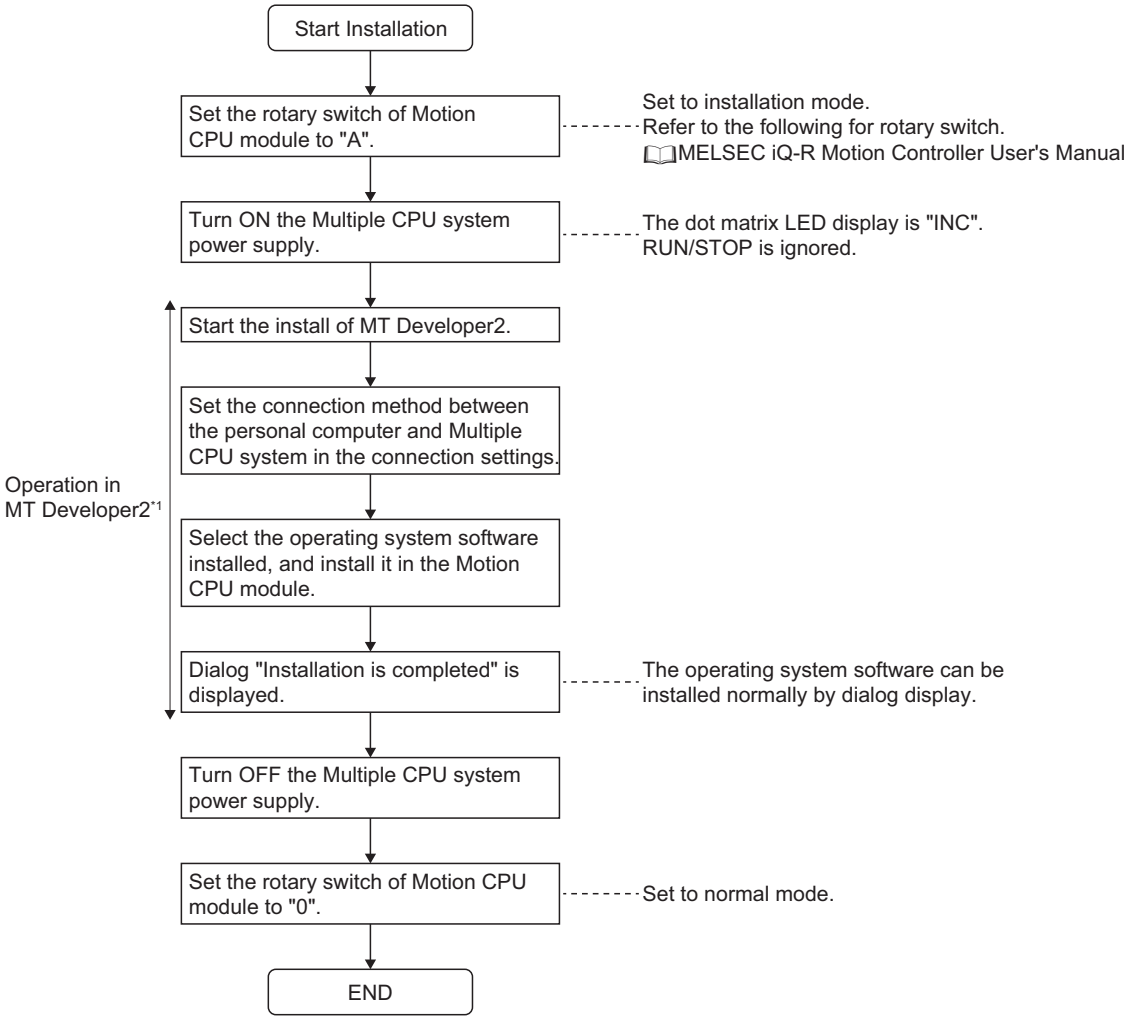
The operating system software is installed in the Motion CPU module when the product is shipped. There is therefore no need to install the operating system software, however, installation is required if upgrading to the latest version or changing the version.

Point

- Be sure to turn OFF the Multiple CPU system power supply before changing rotary switch setting.
- Even if the operating system software is installed, the programs, parameters and absolute position data written in the Motion CPU module not rewritten.
- If installation is interrupted by actions such as "power supply of Multiple CPU system being turned OFF", "RUN/STOP/RESET switch of PLC CPU module being changed to RESET", "power supply of the personal computer being turned OFF. (When using MT Developer2)", "personal computer's communication cable being removed. (When using MT Developer2)", and "the SD memory card being removed. (When using a SD memory card)", files being installed will be deleted. Reinstall the operating system software.
- While the Motion CPU module is in installation mode, a Multiple CPU error will occur at other Multiple CPU system CPUs, and the system will not start up.
- During installation, install operations from other sources will not be accepted. For example, an error will occur if an attempt is made to install from MT Developer2 while performing installation with a SD memory card.
- The capacity of the built-in memory in which Motion CPU module operating system software files are stored is 8MB.
- The model name and version of operating system software installed in the Motion CPU module can be checked in MT Developer2. Refer to the following for details.
  MELSEC iQ-R Motion Controller User's Manual

Installation procedure using MT Developer2

The procedure used to install the operating system software using MT Developer2 is as follows.


Start Installation
Set the rotary switch of Motion CPU module to "A".
Set to installation mode.
Refer to the following for rotary switch.
MELSEC iQ-R Motion Controller User's Manual
Turn ON the Multiple CPU system power supply.
The dot matrix LED display is "INC".
RUN/STOP is ignored.
Operation in MT Developer2*1
Start the install of MT Developer2.
Set the connection method between the personal computer and Multiple CPU system in the connection settings.
Select the operating system software installed, and install it in the Motion CPU module.
Dialog "Installation is completed" is displayed.
The operating system software can be installed normally by dialog display.
Turn OFF the Multiple CPU system power supply.
Set the rotary switch of Motion CPU module to "0".
Set to normal mode.
END

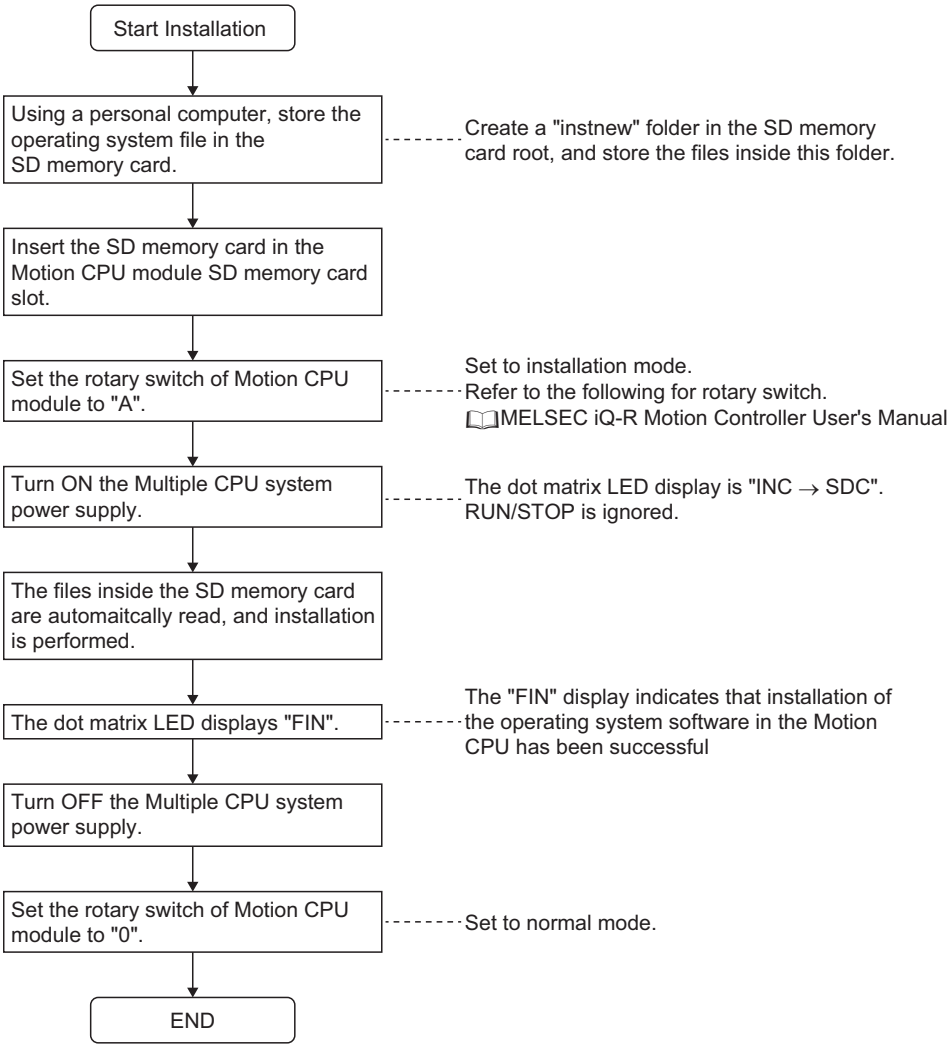
*1 Install the operating system software by screen of MT Developer2. Refer to the following for details.
Help of MT Developer2

Point

Files installed in the Motion CPU module can be compared with files on the personal computer with MT Developer2.

Installation procedure using SD memory card

The procedure used to install the operating system software using a SD memory card is as follows.

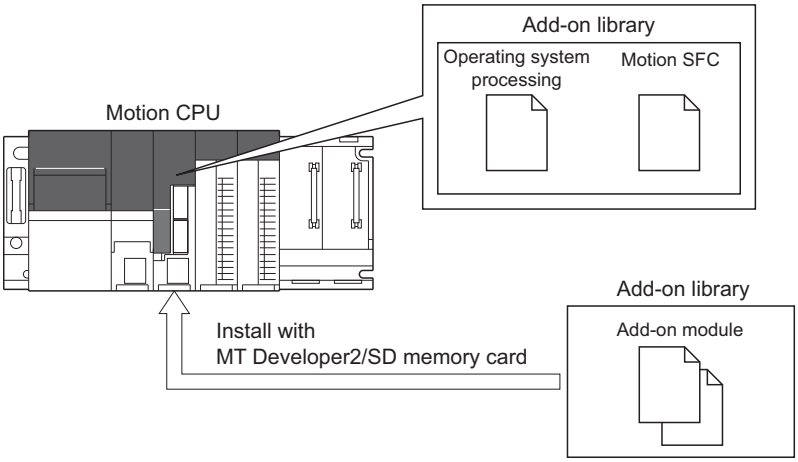

Start Installation
Using a personal computer, store the operating system file in the SD memory card.
Create a "instnew" folder in the SD memory card root, and store the files inside this folder.
Insert the SD memory card in the Motion CPU module SD memory card slot.
Set the rotary switch of Motion CPU module to "A".
Set to installation mode.
Refer to the following for rotary switch.
MELSEC iQ-R Motion Controller User's Manual
Turn ON the Multiple CPU system power supply.
The dot matrix LED display is "INC → SDC".
RUN/STOP is ignored.
The files inside the SD memory card are automaitcally read, and installation is performed.
The dot matrix LED displays "FIN".
The "FIN" display indicates that installation of the operating system software in the Motion CPU has been successful
Turn OFF the Multiple CPU system power supply.
Set the rotary switch of Motion CPU module to "0".
Set to normal mode.
END

Point

- Create a "instnew" folder below the SD memory card root, and store the operating system software files inside this folder.
- If the system is unable to recognize the installation target files after turning the Multiple CPU system power supply ON, the dot matrix LED will not display "INC → SDC", and installation with the SD memory card will not start.
- If an error is detected after starting installation, and it is not possible to complete the installation, the dot matrix LED will display "ER0(SD memory card access error)", "ER1(Install file error)", or "ER2(Built-in ROM access error)". Perform the installation again after removing the error.
- The SD memory card forced stop function cannot be used during installation with a SD memory card. Do not remove the SD memory card during installation.

8.5 Add-on Function

Functions of the Motion CPU module can be expanded by installing files supplied as add-on libraries to the Motion CPU module.



The add-on modules inside the add-on library are executed by the following methods.

Automatically execute at a selected timing

The add-on module is automatically executed at one of the selected timings below.

Refer to the instruction manual of the add-on library installed for details of execution timing.

- At initialization of Motion CPU
- At the switching between OFF/ON of "[Rq.1120] PLC ready flag (M2000)"
- Every operation cycle
- Every main cycle

Call from the user program

With the Motion SFC program MCFUN instruction, the add-on module can be called from the user program.

When calling from the user program, specify the add-on module with the module name that is registered when the add-on module is installed, and deliver the input value and output value by device.

Ex.

Calling the add-on module with the module name "AddonFunc1" with the MCFUN instruction

```
MCFUN "AddonFunc1",D5000,D5100,M0
```

Refer to the following for details of the MCFUN instruction.

MELSEC iQ-R Motion Controller Programming Manual (Program Design)

Refer to the instruction manual of the add-on library installed for details of the MCFUN instruction for each add-on module.

Add-on module structure

An add-on module comprises of the following units.

Name	Details
Add-on module	Module that executes expansion functions.
Add-on library	A file that encompasses one or more add-on modules. The method for calling each add-on module is defined in the add-on library. When installing to the Motion CPU module, the entire add-on library is installed.

Module names

The Motion CPU module identifies add-on modules by module name.

If module names are duplicated when installing several add-on libraries, a moderate error (error code: 308FH) occurs at the initial processing of the Motion CPU module.

Installing add-on library

The add-on library is installed to the built-in memory of the Motion CPU module via MT Developer2, or the SD memory card. Refer to installing the operating system software for the installation method. (☞ Page 234 Installing the Operating System Software)

Point

- The capacity of the memory in which the operating system software and add-on library are stored is 8MB. Make sure the total size of operating system software and add-on library files is no more than 8MB.
- Use MT Developer2 for checking the installed add-on library version, and deleting add-on library files from the Motion CPU module.
- Restrictions can occur depending on the version of the operating system software installed in the Motion CPU module, and when combining with other add-on libraries already installed. When an add-on library that cannot be combined is installed, a moderate error (error code: 308FH) occurs at the initial processing of the Motion CPU module, and the Motion CPU module does not RUN.

Add-on function load error

The following describes the details codes and corrective actions when add-on function load error (moderate error (error code: 308FH)) is detected.

Details code	Error name	Corrective action
0500	Device number outside the range	The device number of a device used by the add-on library is outside the range. Correct the device number of the CPU parameter so that it is within the range.
0510	Operating system not supported	An add-on library not supported by the operating system is installed. Check the operating system version that supports the add-on library.
0511	Operating system support ended	An add-on library that the operating system has ended support for is installed. Delete the add-on library.

9 RAS FUNCTIONS

9.1 Self-Diagnostics Function

Checks if a problem exists with the Motion CPU.

Self-diagnostics timing

If an error occurs when the Multiple CPU system power supply is turned ON or while it is in the RUN/STOP state, the Motion CPU detects, and displays the error, and stops operation depending on the error details.
However, depending on the error occurrence status or the instruction to execute, the Motion CPU may not be able to detect the error. Configure safety circuits external to the Motion CPU to ensure that the entire system operates safely even in such a case.

Error checking methods

This section describes the check methods when errors occur.

Checking by LED display

Check the following LED displays on the Motion CPU.Refer to the following for LED display details.
📖MELSEC iQ-R Motion Controller User's Manual

■ERROR LED
The ERROR LED is ON (or flickers).

■Dot matrix LED
The dot matrix LED displays ""AL" (flickers 3 times) → "Error code" (4 digits shown 2 at a time)".

Checking by special relay, special register

- The following special relays and special registers store the error content. Refer to the following for details on special relays and special registers.
  - Special relays(☞ Page 295 Special Relays)
  - Special registers(☞ Page 300 Special Registers)

	Device name
Special relays	• Latest self diagnostics error (SM0) • Latest self-diagnostics error (SM1) • Warning detection (SM4) • Detailed information 1: flag in use (SM80) • Detailed information 2: flag in use (SM112)
Special registers	• Latest self diagnostics error code (SD0) • Clock time for latest self-diagnostic error occurrence (SD1 to SD7) • Self-diagnostic error code (SD10 to SD25) • Detailed information 1 information category (SD80) • Detailed information 1 (SD81 to SD111) • Detailed information 2 information category (SD112) • Detailed information 2 (SD113 to SD143)

Checking by GX Works3

The error information list is checked by GX Works3 module diagnostics.
Refer to the following for details of module diagnostics.
📖GX Works3 Operating Manual

Checking by MT Developer2

Motion error history is checked at the MT Developer2 Motion CPU error batch monitor. Refer to the following for details of the Motion CPU error batch monitor.

📖Help of MT Developer2

Checking by axis status signals, and axis monitor devices

Error details detected for each axis is stored for each axis status signal and each axis monitor device.

Refer to error codes stored using the Motion CPU for error details stored for each axis status signal and each axis monitor device. (☞ Page 250 Error codes stored using the Motion CPU)

Checking by event error history

Check the operation and error details with the "event history" file saved in the Motion CPU standard ROM, or SD memory card.

Refer to event history function for details of event history. (☞ Page 246 Event History Function)

Operations at error detection

If an error is detected by self-diagnosis, the Motion CPU operates in the following modes.

Modes at error detection

■Stop mode

In this mode, Motion CPU operation is stopped. All programs are stopped the moment the error is detected, and all external outputs are turned OFF for modules set to "Stop" in "I/O Assignment Setting" → "CPU Module Operation Setting at Error Detection" (☞ Page 48 CPU parameter).

However, external outputs are retained for modules set to "Continue" in "CPU Module Operation Setting at Error Detection". In either case, device memory outputs (Y) are retained.

Depending on the error content, positioning of all axes is stopped.

Refer to the following for details on error stop processing.

📖MELSEC iQ-R Motion Controller Programming Manual (Positioning Control)

■Continue mode

In this mode, Motion CPU operation is continued. Depending on the error content, there may be times when the program for which the error was detected or positioning control is stopped, however, execution of unrelated programs and positioning control continues.

Error status at error detection

The error status is categorized into major errors, moderate errors, and minor errors.

The status for which it is not possible to continue program or axis control for the Motion CPU, in full or in part, is categorized as an error.

Error status	Motion CPU operation mode	Multiple CPU system operation	Program execution status	Axis control status*2	Cause
Major error	Stop mode	Other CPUs can be stopped*1	All programs stop	All axes stop	There is an error in the Motion CPU hardware, and operation cannot be continued.
Moderate error					Program execution or axis operation cannot be continued due to an incorrect program or parameter setting, or temporary noise, etc.
	Continue mode	Continues	Complete or partial stop depending on error content	Continues	Axis operation continues, however, programs cannot be executed due to an incorrect program or parameter setting.
Minor error			Continues	Relevant axis only stops	Axis operation start/continue is not possible due to incorrect program or parameter settings, or external signal status. Program execution continues.
Warning				Continues	An insignificant error is detected such as an incorrect program or parameter setting, or imperfect control change timing. Axis operation and program execution continue as is.

*1 Stop/continue can be set in the Multiple CPU parameters for other CPUs.

*2 Refer to the following for details on stopping.
📖MELSEC iQ-R Motion Controller Programming Manual (Positioning Control)

Setting operation at error detection

Depending on the self-diagnosis content, operation when errors are detected can be set in the CPU parameters.

Refer to CPU parameter for details of setting contents. (☞ Page 48 CPU parameter)

Cancelling errors

Continue errors (minor errors, or continue mode moderate errors) and warnings can be cancelled.

Cancelling errors

Use the following method to cancel errors after eliminating the cause.

■Cancelling method with GX Works3

Cancel with GX Works3 "Module diagnostics"

■Cancelling method with MT Developer2

Cancel with MT Developer2 "Motion Monitor"

■Cancelling method with special relay

Cancel with "Error reset (SM50)"

Errors that can be cancelled

The following is a list of errors that can be cancelled.

Error type	Information required to cancel error
System common errors	• Self-diagnostic error information (SD0 to SD7, SD10 to SD25) • Diagnosis error detection (SM0, SM1) • Warning detection (SM4) • Error information 1 (SD80 to SD111) • Error information 2 (SD112 to SD143) • Detailed information 1: flag in use (SM80) • Detailed information 2: flag in use (SM112)
Positioning/synchronous control output axis errors/warnings*1	• Warning code • Error code • Error detection signal
Servo alarms/warnings*1	• Servo error code • Servo error detection signal
Synchronous control input axis errors/warnings*1	• Command generation axis warning code • Command generation axis error code • Command generation axis error detection signal • Synchronous encoder axis warning No. • Synchronous encoder axis error No. • Synchronous encoder axis error detection No.

*1 Clears errors for all axes at the same time.

After cancelling errors, error-related special relays/special registers, and the LED display return to the condition prior to the error. If the same error occurs again after cancelling the error, the error is registered again in the error history.

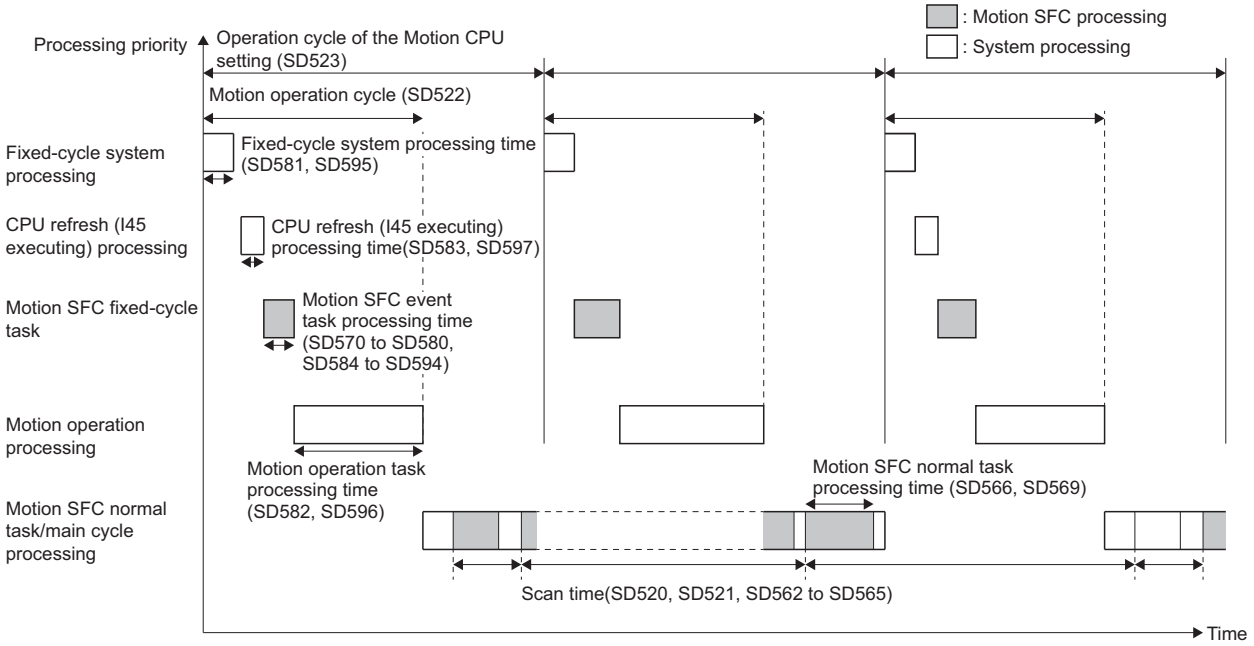
Operation when errors cancelled for each axis

If an axis error reset or servo error reset is performed, the error detection signal for each axis, axis error No., and axis warning No. are reset, however, diagnostic errors are not reset.

9.2 Safety Functions

Processing time monitor and check

The time taken for Motion operation and Motion SFC program execution can be monitored with a special register. The Motion CPU internal processing timing and corresponding processing time monitor devices are shown in the following diagram.


: Motion SFC processing
: System processing
Processing priority
Operation cycle of the Motion CPU setting (SD523)
Motion operation cycle (SD522)
Fixed-cycle system processing
Fixed-cycle system processing time (SD581, SD595)
CPU refresh (I45 executing) processing
CPU refresh (I45 executing) processing time(SD583, SD597)
Motion SFC fixed-cycle task
Motion SFC event task processing time (SD570 to SD580, SD584 to SD594)
Motion operation processing
Motion operation task processing time (SD582, SD596)
Motion SFC normal task processing time (SD566, SD569)
Motion SFC normal task/main cycle processing
Scan time(SD520, SD521, SD562 to SD565)
Time

*1: The "Motion operation cycle (SD522)" maximum value latches to the "Maximum Motion operation cycle (SD524)".

*2: The "Scan time (SD520)" and "Scan time (SD562, SD563)" maximum values latch to the "Maximum scan time (SD521)" and "Maximum scan time (SD564, SD565)".

*3: The processing time when an operation cycle over occurs latches to the following special registers.

- "Fixed-cycle system processing time (SD581)" → "Fixed-cycle system processing time within operation cycle (SD595)"
- "CPU refresh (I45 executing) processing time (SD583)" → "CPU refresh (I45 executing) time within operation cycle (SD597)"
- "Motion SFC event task (0.222ms to 14.222ms task individually) processing time (SD570 to SD580)" → "Motion SFC event task (0.222ms to 14.222ms task individually) operation cycle (SD584 to SD594)"
- "Motion operation task processing time (SD582)" → "Motion operation task time within operation cycle (SD596)"

*4: The EI/DI status can be monitored as an "EI flag (SM752)" as the Motion SFC event task monitor.

The Motion CPU uses the self-diagnostic function to check the processing time for all processing. Details of the processing time check and the action taken when an error occurs are shown below.

Operation cycle check

If the total time (Motion operation cycle (SD522)) taken for fixed-cycle system processing, Motion SFC fixed-cycle tasks, and Motion operation exceeds the "Operation cycle of the Motion CPU setting (SD523)", the "[St.1046] Operation cycle over flag (M2054)" turns ON. Depending on the control conditions, the amount of time taken for Motion operation may exceed the operation cycle, even if the operation cycle setting is the "Default setting".

- The following operations are performed if an operation cycle over condition is detected.
  - "[St.1046] Operation cycle over flag (M2054)" turns ON
  - Latching (updating stopped) of the time within each operation cycle for processing time monitor devices is performed.
- If an operation cycle over condition is detected, monitor the special register which stores the processing time, and take the following measures to ensure that the time taken for the Motion operation does not exceed the set operation cycle.
  - Change the operation cycle to a larger value in [Motion CPU Common Parameter] → [Basic Setting] → [System Basic Setting] → "Operation Cycle" setting.
  - Reduce the number of event task and NMI task command executions in the Motion SFC program.
- Use the following procedure to turn the "[St.1046] Operation cycle over flag (M2054)" OFF.
  - Turn the Multiple CPU system power supply from ON to OFF.
  - Reset the Multiple CPU system.
  - Perform a reset with the user program.

Point

Command updating to the servo amplifier stops for cycles for which an operation cycle over condition occurs, leading to abnormal machine noises and vibrations, and impact.

Watchdog timer (WDT)

If the "Scan time (SD520)" exceeds 1.0 [s], the "Motion CPU WDT error (SM512)" turns ON, and axes that have started are stopped immediately without reducing speed.

If the "Motion CPU WDT error (SM512)" turns ON, reset the Multiple CPU system. If the "Motion CPU WDT error (SM512)" turns ON even after resetting, check the cause of the "Motion CPU WDT error (SM512)", and if the cause is a "Main cycle over" condition, take either of the following measures.

- Change the operation cycle to a larger value in the [Motion CPU Common Parameter] → [Basic Setting] → [System Basic Setting] → "Operation Cycle" setting.
- Reduce the number of normal task, event task, and NMI task command executions in the Motion SFC program.

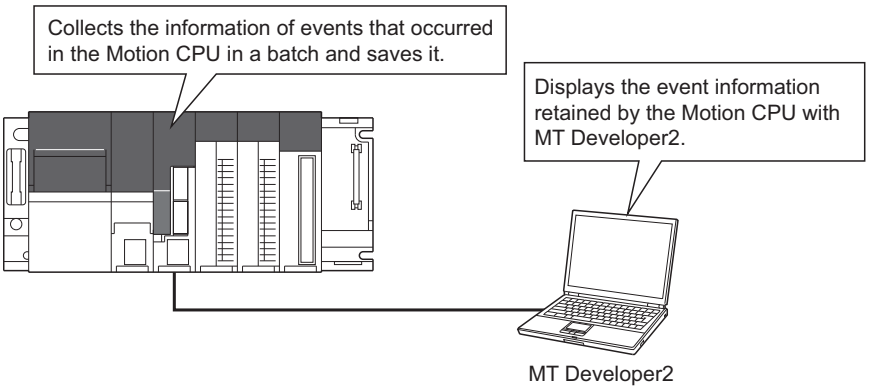
Devices relating to processing time

The Motion CPU main cycle, Motion operation cycle, and Motion SFC program execution time is monitored with the following special registers. (☞ Page 300 Special Registers)

No.	Name
SD520	Scan time
SD521	Maximum scan time
SD522	Motion operation cycle
SD523	Operation cycle of the Motion CPU setting
SD524	Maximum Motion operation cycle
SD562	Scan time
SD563	
SD564	Maximum scan time
SD565	
SD566	Motion SFC normal task processing time
SD567	
SD568	Maximum Motion SFC normal task processing time
SD569	
SD570	Motion SFC event task (14.222ms) processing time
SD571	Motion SFC event task (7.111ms) processing time
SD572	Motion SFC event task (3.555ms) processing time
SD573	Motion SFC event task (1.777ms) processing time
SD574	Motion SFC event task (0.888ms) processing time
SD575	Motion SFC event task (0.444ms) processing time
SD576	Motion SFC event task (0.222ms) processing time
SD578	Motion SFC event task (external interrupt) processing time
SD579	Motion SFC event task (PLC interrupt) processing time
SD580	Motion SFC NMI task processing time
SD581	Fixed-cycle system processing time
SD582	Motion operation task processing time
SD583	CPU refresh (I45 executing) processing time
SD584	Motion SFC event task time within operation cycle (14.222ms)
SD585	Motion SFC event task time within operation cycle (7.111ms)
SD586	Motion SFC event task time within operation cycle (3.555ms)
SD587	Motion SFC event task time within operation cycle (1.777ms)
SD588	Motion SFC event task time within operation cycle (0.888ms)
SD589	Motion SFC event task time within operation cycle (0.444ms)
SD590	Motion SFC event task time within operation cycle (0.222ms)
SD592	Motion SFC event task (external interrupt) time within operation cycle
SD593	Motion SFC event task (PLC interrupt) time within operation cycle
SD594	Motion SFC NMI task time within operation cycle
SD595	Fixed-cycle system processing time within operation cycle
SD596	Motion operation task time within operation cycle
SD597	CPU refresh (I45 executing) time within operation cycle

9.3 Event History Function

The Motion CPU stores errors detected by the module, operations done for the module as "event history" in the standard ROM of the Motion CPU, or the SD memory card. Once errors and operations are stored, their occurrence history and other information can be checked chronologically. This function helps to determine the causes of problems that have occurred in the equipment/devices, check the update status of the Motion CPU control data, and detect unauthorized access.


Collects the information of events that occurred in the Motion CPU in a batch and saves it.
Displays the event information retained by the Motion CPU with MT Developer2.
MT Developer2

Point

The event history information is constantly collected regardless of the operating state of the Motion CPU. There are occasions, however, when the event history information cannot be collected due to a major error in a module, a base unit error, a cable failure, or some other cause.

Event history settings

Under normal circumstances, the event history function can be used with its default settings and need not be manually configured. The storage memory and size settings for event history files can be changed as needed.(☞ Page 48 CPU parameter)

Saving event history

This section describes events saving for the event history.

Modules from which event history information is collected

For the Motion CPU, only events that occur on the self CPU are saved.
Events on the modules managed by the self CPU are not saved.

Events saved by the CPU module

Information saved in the event history includes operation initiator and other detailed information for troubleshooting purposes.
For events that are saved in the event history on the Motion CPU, refer to event list. (☞ Page 291 Event List)

Event history file

The storage memory and file size for event history files can be changed in event history setting. Refer to CPU parameter for details of the event history setting. (☞ Page 48 CPU parameter)

■Storage memory

Choose either the standard ROM or SD memory card. If the storage memory is the SD memory card, when the write protect switch of the SD memory card is enabled, an event history will not be stored. (It is still possible to read the event history file in the SD memory card using MT Developer2.)

Therefore, if the write protect switch of the SD memory card is changed from disabled to enabled during operation, a write error to the SD memory card occurs when an event for storing in the event history occurs (SD memory card available event is registered) after the write protect switch is enabled. (At the time immediately after an error has occurred, the module diagnostics of GX Works3 can detect it, however, after the Multiple CPU system power supply is turned OFF to ON or after resetting operation, the error that occurred will not be stored in the event history.)

Point

For a system where file writes occur frequently or the communication conditions are unstable and frequently change, the event history file size should be made large enough to accommodate a greater number of events. If this is the case, the SD memory card is highly recommended as the storage memory.

■File size

The size for event history files can be changed in event history setting. (☞ Page 48 CPU parameter) If the specified size is exceeded, the records are deleted from the oldest one and the latest one is stored. An event history file size is obtained from the following calculation formula.

Event history file size = File header size + Event history management information size + (Number of records × Size per event history record)

Element	Size
File header size	20 bytes
Event history management information size	12 bytes
Size per event history record	At least 40 bytes*1

*1 Because the contents of detailed information may differ depending on the event to be saved or the detailed information may include a variable-length file name, the size per event history record is variable.

The number of events to be saved in the event history file differs depending on the event type to be saved. An example for when the event history file size is 128K bytes (default) is shown below.

Ex.

Minor error (error code: 1901H)

Because one record is 64 bytes, approximately 2040 events can be registered.

■Timing of file creation

Event history files are created at the following times.

- The Multiple CPU system power supply is turned OFF and ON (if there is no event history file or after the event history settings are changed).
- The Multiple CPU system is reset (if there is no event history file or after the event history settings are changed).
- Initialization of the SD memory card (when no event history file exists)*1
- Write of parameters (when no event history file exists, or after an event history setting is changed).

*1 When a parameter is stored in the standard ROM, the event history file is created on the SD memory card, according to the event history setting.

Point

When a new event history file is created, that operation is logged into the event file as an event.

The following table shows how the event history is treated depending on operation.

Operation	Operation for the event history
Memory initialization	When this event occurs, the event history is stored into the internal memory. If the internal memory reaches the maximum number of event history records it can store, all subsequent events are lost.
Event history creation	The event history, which has been stored in the internal memory during absence of the event history file, is stored into the standard ROM or the SD memory card. (If any event was lost, it is logged as "*HST LOSS*".)

Indicates the operation of the event history for the SD memory which was removed and mounted in case that the save destination memory is the SD memory.

Operation	Operation for the event history
Removal of the SD memory card	When this event occurs, the event history is stored into the internal memory. If the internal memory reaches the maximum number of event history records it can store, all subsequent events are lost.
Installation of the SD memory card	The event history that has been stored in the internal memory during absence of the SD memory card, is stored to the SD memory card. If the re-inserted SD memory card contains an event history file of the same file size, the CPU module continues to store the event history information. If the file size is different, the CPU module removes the existing event history file and creates a new event history file.

■Timing of parameters taking effect

Any changed parameters take effect at the following times.

- The Multiple CPU system power supply is turned ON.
- The Multiple CPU system is reset

Point

Any changed parameters written in the storage memory with the Motion CPU in the STOP state does not take effect when the Motion CPU operating state is changed from STOP to RUN. In this case, the changed parameters will take effect the next time when the Motion CPU is turned OFF and ON or reset.

Loss of event history information

If many events are detected frequently, some events may be lost without being collected. When event loss occurs, "*HST LOSS*" appears in the "Event Code" field of MT Developer2.

Viewing the event history

The Motion CPU event history can be viewed using MT Developer2. For operating procedures and how to interpret the displayed information, refer to the following.

Help of MT Developer2

Clearing the event history

The event history can be cleared using the event history window in MT Developer2. Once the event history is cleared, all the event history information stored in the specified storage memory is deleted. For operating procedures and other details, refer to the following.

Help of MT Developer2

APPENDICES

Appendix 1 Error Codes

When the Motion CPU detects an error with the self-diagnostic function, the error is displayed on the Motion CPU LED display, and the error code is stored in the relevant device.
Use the relevant device in which the error code is stored in the program to enable a machine control interlock. By checking the error code, the error details and cause can be determined. Refer to error checking methods for how to check the error details and error code. (☞ Page 239 Error checking methods)

Error codes system

Error codes for all modules are expressed with 4 hexadecimal digits (integer without 16-bit sign). There are errors detected with each module's self-diagnostic function, and common errors detected when communicating between modules. The error detection types and error code ranges are shown below.

Error detection type	Error code range	Description
Detection with each module's self-diagnostic function	0001H to 3FFFH	These are errors such as module self-diagnostic errors that are different for each module.
Detection when communicating between modules	4000H to FFFFH	CPU module error
	7000H to 7FFFH	Serial communication module error
	B000H to BFFFH	CC-Link module error
	C000H to CFFFH	Ethernet module error
	D000H to DFFFH	CC-Link IE field network module error
	E000H to EFFFH	CC-Link IE controller network module error
	F000H to FFFFH	MELSECNET/H network module, MELSECNET/10 network module error

Detailed information

When errors are detected during self-diagnosis, detailed information indicating the cause of the error is also stored.
Detailed information on each error code can be checked with the engineering tool.
The following detailed information is saved for each error code. (Up to two types of detailed information are stored, and the type differs for each error code.)

Detailed information	Item	Details
Detailed information 1	Program positioning information	Displays positioning related information in the program.
	Drive No., file name	Displays information relating to the drive No. and file name.
	Parameter information	Displays parameter related information such as the parameter storage target and parameter types.
	System configuration information	Displays system configuration related information such as I/O Nos. and power supply Nos.
	Count information	Displays count related information such the number of times data is written to the memory.
	Time information	Displays time related information.
Detailed information 2	Drive No., file name	Displays information relating to the drive No. and file name.
	Parameter information	Displays parameter related information such as the parameter storage target and parameter types.
	System configuration information	Displays system configuration related information such as I/O Nos. and power supply Nos.

Detailed information on the latest error codes can also be checked from special registers (SD). Detailed information is stored in "Detailed information 1 (SD81 to SD111)" and "Detailed information 2 (SD113 to SD143)". The stored information type is determined with "Detailed information 1 information category (SD80)" and "Detailed information 2 information category (SD112)".(☞ Page 300 Special Registers)

Operations at error occurrence

There are two types of errors, stop errors and continue errors.
Refer to operations at error detection for details of stop errors and continue errors. (☞ Page 241 Operations at error detection)

Cancelling errors

Continue errors (minor errors, or continue mode moderate errors) and warnings can be cancelled. Refer to cancelling errors for details of cancelling errors. (☞ Page 242 Cancelling errors)

Error codes stored using the Motion CPU

Errors detected at the Motion CPU are divided into warnings and errors.
The categories and error code range of errors detected at the Motion CPU are shown below.

Category			Error code range
Warning			0800H to 0FFFH
Error	Minor	Common	1000H to 17FFH
		Unique	1800H to 1FFFH
	Minor (SFC)	Unique	3100H to 3BFFH
	Moderate	Common	2000H to 2FFFH
		Unique	3000H to 30FFH
	Major	Common	3C00H to 3DFFH
		Unique	3E00H to 3FFFH

- The error detection signal of the error axis turns on at the error occurrence, and the error codes are stored in the error code storage register shown below.

Error class		Error code storage register	Error detection signals	Error reset command
Servo axis	Warning	D6+20n ([Md.1003])	M2407+20n ([St.1067])	M3207+20n ([Rq.1147])
	Error	D7+20n ([Md.1004])		
	Servo Error	D8+20n ([Md.1005])	M2408+20n ([St.1068])	M3208+20n ([Rq.1148])
Command generation axis	Warning	D12602+20n ([Md.341])	M9807+20n ([St.344])	M10967+20n ([Rq.346])
	Error	D12603+20n ([Md.342])		
Synchronous encoder axis	Warning	D13250+20n ([Md.327])	M10444+10n ([St.324])	M11600+4n ([Rq.324])
	Error	D13251+20n ([Md.326])		

*1 For R16MTCPU, the valid range is from axis 1 to axis 16.

- If another error occurs after an error code has been stored, the existing error code is overwritten, deleting it. However, the error history can be checked using MT Developer2.
- Error detection signals and error codes are held until the "[Rq.1147] Error reset command (M3207+20n)", "[Rq.1148] Servo error reset command (M3208+20n)", "[Rq.346] Command generation axis error reset command (M10967+20n)", or "[Rq.323] Synchronous encoder axis error reset (M11600+4n)" turns ON.
- When a servo error or servo warning occurs, a minor error (error code: 1C80H) or warning (error code: 0C80H) is stored in "[Md.1005] Servo error code (D8+20n)", and servo amplifier error codes or warning codes are not stored. Error codes or warning codes read from the servo amplifier are stored in "[Md.1019] Servo amplifier display servo error code (#8008+20n)".

Point

- Even if "[Rq.1148] Servo error reset command (M3208+20n)" turns ON at the servo error occurrence, the same error code might be stored again.
- When a servo error occurs, reset the servo error after removing the error cause on the servo amplifier side.

Warning (0800H to 0FFFH)

Warning details and causes, and corrective action are shown below.

Error code	Error name	Error details and cause	Corrective action
093CH	Home position data incorrect	There is a factor that the execution of the home position return is needed in the absolute position system. • The home position return has never been executed after the system start. • The home position return is started, but not completed. • The absolute value data in the Motion CPU disappeared due to the reasons such as battery fault. • Absolute position erase of servo amplifier was detected. • At servo amplifier power-on, a communication error occurred between the servo amplifier and encoder. • "Rotation direction selection" of the servo parameter is changed.	Execute the home position return after checking the batteries of the Motion CPU module and the servo amplifier.
093DH	Control unit incorrect setting	The interpolation control unit of the parameter block is different from the control unit of the fixed parameters.	Combine the control unit of the fixed parameter and parameter block.
093EH	SSCNET communication error	During operation, the "Encoder current value [pulse]" was mismatched with the "Feedback current value [pulse]" (encoder effective bit number). It is always checked after the servo amplifier power supply on (in both servo ON and OFF states).	Check the motor and encoder cables.
093FH	Allowable travel value over during power off	The motor travel value while the power is off exceeded the "Allowable travel during power-off" set in the "Amplifier setting" at servo amplifier power-on.	• Check the position. • Check the battery of the servo amplifier."
0981H	JOG speed limit value	• The set JOG speed is higher than the JOG speed limit value. • The set JOG speed limit value is out of the control unit range.	• Set within the range of 1 to JOG speed limit value. • Set the JOG speed limit value within the range.
0987H	Incorrect simultaneous start of JOG operation	Both of forward and reverse rotations were set at the simultaneous start for the JOG operation.	Set either forward rotation or reverse rotation.
0988H	Manual pulse generator input magnification outside range	The manual pulse generator input magnification is outside the range of 1 to 10000.	Set the manual pulse generator input magnification within the range of 1 to 10000.
098EH	Manual pulse generator start specified axis number over	The manual pulse generator start specified axis number is more than 4.	Set the manual pulse generator start specified axis number less than 3.
098FH	Manual pulse generator smoothing magnification outside range	The manual pulse generator smoothing magnification is outside the range of 0 to 59.	Set the manual pulse generator smoothing magnification within the range of 0 to 59.
0991H	Speed limit value over	• The speed after the change is out of the range of 0 to Speed limit value. (Unable to change to a minus speed) • The absolute speed value after the change is out of the range of 0 to Speed limit value. • The speed from "command speed of program × override ratio" is out of the range of 0 to Speed limit value. • The speed from "speed change request × override ratio" is out of the range of 0 to Speed limit value.	• Set the speed within the range of 0 to Speed limit value control after change. • Set the speed absolute value within the range of 0 to Speed limit value after change. • Set "command speed of program × override ratio" and "speed change request × override ratio" within the range of 0 to Speed limit value.
099BH	Target position change prohibited	The target position change request (CHGP) was executed for the axis that executes the servo instruction which does not support the target position change.	Change the target position for the axes operated by the following servo instructions. • Linear interpolation control • Fixed-pitch feed control • Continuous trajectory control
09E1H	High-speed oscillation frequency outside range	"Frequency specified by high-speed oscillation function × override ratio" exceeds 5000[CPM].	Set so that "frequency specified by high-speed oscillation function × override ratio" does not exceed 5000[CPM].
09E2H	Illegal override value	• The value set in override ratio setting device is outside the setting range when starting. • The new value of the override ratio setting device is outside the setting range when controlling.	Set the value of the override ratio within the valid range.
09E3H	Pressure control setting value outside range	Necessary setting value for pressure controlling is outside the range.	Correct the setting value.
09E4H	Torque limit value over	The absolute value of command torque is outside the range of 0 to Torque limit value in speed-torque control when the torque or stopper is controlling.	Set the torque within the range of 0 to Torque limit value in speed-torque control after change.

Error code	Error name	Error details and cause	Corrective action
09E7H	Control mode switching during zero speed OFF	The switching request of control mode was executed when the zero speed was turned OFF.	• Switch the control mode when the axis is stopped and the zero speed is turned ON. • Make "Invalid selection during zero speed at control mode switching" valid when not waiting for the stop of the servo motor.
09E8H	Control mode outside range	Specify the incorrect value in the control mode setting device and execute the control mode switching.	• Correct the value of the control mode setting device. • Return to the mode before the continuous mode is changed when switching the continuous control mode to control mode.
09EAH	Control mode switching incorrect	The control mode switching request of speed-torque control was executed for the axis that connects to the drive which do not support the control mode switching.	Do not switch the control mode switching request of speed-torque control for the axis that connects to the drive which does not support the control mode switching.
09EBH	Control mode switching prohibited	Unable to switch during operation when switching to the stopper control was requested.	Request the switching during operation when switching to the stopper control is available.
09ECH	Continuous path control speed limit value over	During continuous path control, the speed at a passing point exceeded the speed limit value.	Set the speed command value within the range of 1 to Speed limit value.
09EDH	Speed change prohibited during home position return	The speed changed against the axis at the timing of the home position return.	Do not change the speed at the timing of the home position return.
09EEH	Speed change prohibited during high-speed oscillation	The speed is changed when the high-speed oscillation starts moving.	Do not change the speed during the high-speed oscillation.
09EFH	Stroke limit invalid axis minus speed change impossible	Changing speed to negative speed is executed in the invalid axis of stroke limit.	Do not change speed to negative speed in the invalid axis of stroke limit.
0A10H	Command speed outside range	• The specified command speed is outside the range of 1 to Speed limit value. • The specified command speed is outside the setting range.	Set the command speed within the range of 1 to Speed limit value.
0A39H	Specify FIN acceleration/ deceleration during vibration suppression command filter mode selecting	Set the FIN acceleration/deceleration in the status which specified mode selection device of vibration suppression command filter 1.	Do not specify the mode selection device of vibration suppression command filter 1 when use FIN acceleration/ deceleration.
0A3AH	Vibration suppression command filter mode outside the range	The value of mode selection of vibration suppression command filter 1 or 2 was set outside the range.	Revise the mode selection value of vibration suppression command filter.
0A3BH	Vibration suppression command filter frequency setting outside the range	The value of frequency of vibration suppression command filter 1 or 2 was set outside the range.	Revise the frequency setting value of vibration suppression command filter inside the setting range.
0A3CH	Vibration suppression command filter depth setting outside the range	The depth value of vibration suppression command filter 1 was set outside the range.	Revise the depth setting value of vibration suppression command filter 1 inside the setting range.
0A3DH	Parameter block No. setting outside range	Specified parameter block No. is outside the range of 1 to 64.	Set the specified parameter block No. within the range of 1 to 64.
0A3EH	Dwell time setting outside range	The dwell time is outside the range of 0 to 5000 [ms].	Set the dwell time within the range of 0 to 5000 [ms].
0A3FH	M code setting outside range	The setting of M code is outside the range of 0 to 32767.	Set the M code within the range of 0 to 32767.
0A40H	Torque limit value setting outside range	The setting of torque limit value is outside the range of 1 to 10000 [×0.1%].	The setting of torque limit value is set within the range of 1 to 10000 [×0.1%].
0A41H	Auxiliary control unit setting outside range	The auxiliary control unit is outside the range of 0 to 3.	Set the auxiliary control unit within the range of 0 to 3.
0A42H	Speed limit value setting outside range	The speed limit value is outside the setting range.	Set the speed limit value within the valid range.
0A43H	Acceleration time setting outside range	The acceleration time is outside the range of 1 to 8388608 [ms].	Set the acceleration time within the range of 1 to 8388608 [ms].
0A44H	FIN acceleration/ deceleration setting outside range	The FIN acceleration/deceleration time is outside the range of 1 to 5000 [ms].	Set the FIN acceleration/deceleration time within the range of 1 to 5000 [ms].

Error code	Error name	Error details and cause	Corrective action
0A45H	Fixed position stop acceleration/deceleration time setting outside range	The fixed position stop acceleration/deceleration time is outside the range of 1 to 8388608 [ms].	Set the setting of fixed position stop acceleration/ deceleration time within the range of 1 to 8388608 [ms].
0A46H	Deceleration time setting outside range	The deceleration time is outside the range of 1to 8388608 [ms].	Set the deceleration time within the range of 1 to 8388608 [ms].
0A47H	Rapid stop deceleration time setting outside range	The rapid stop deceleration time is outside the range of 1 to 8388608 [ms].	Set the rapid stop deceleration time within the range of 1 to 8388608 [ms].
0A48H	P. torque limit value setting outside range	The P. torque limit value is outside the range of 1 to 10000 [×0.1%].	Set the P. torque limit value within the range of 1 to 10000 [×0.1%].
0A49H	Allowable range of circular interpolation setting outside range	Allowable error range for circular interpolation is outside the setting range.	Set the circular interpolation within the valid range.
0A4AH	Repetition count setting outside range	The repetition count is outside the range of 1 to 32767.	Set the repetition count within the range of 1 to 32767.
0A4BH	S-curve ratio setting outside range	S-curve ratio is set outside the range of 0 to 100 [%] at the S-curve acceleration/deceleration specification.	Set the S-curve ratio within the range of 0 to 100 [%].
0A4CH	Bias speed at start setting outside range	• The bias speed at start is outside the range of 0 to Speed limit value. • The command speed is outside the range of Bias speed at start to Speed limit value.	• Set the bias speed at start within the range of 0 to Speed limit value. • Set the command speed within the range of Bias speed at start to Speed limit value.
0A4DH	Bias speed at start combined error	The following acceleration/deceleration systems were specified in a servo program whose bias speed at start is not 0. • FIN acceleration/deceleration • Advanced S-curve acceleration/deceleration	When specifying the following acceleration/deceleration systems, set the bias speed at start to 0. • FIN acceleration/deceleration • Advanced S-curve acceleration/deceleration
0A4EH	Advanced S-curve acceleration section 1 setting outside range	Acceleration section 1 ratio is outside the range of 0.0 to 100.0 [%].	Set the acceleration section 1 ratio within the range of 0.0 to 100.0 [%].
0A4FH	Advanced S-curve acceleration section 2 setting outside range	Acceleration section 2 ratio is outside the range of 0.0 to 100.0 [%].	Set the acceleration section 2 ratio within the range of 0.0 to 100.0 [%].
0A50H	Advanced S-curve deceleration section 1 setting outside range	Deceleration section 1 ratio is outside the range of 0.0 to 100.0 [%].	Set the deceleration section 1 ratio within the range of 0.0 to 100.0 [%].
0A51H	Advanced S-curve deceleration section 2 setting outside range	Deceleration section 2 ratio is outside the range of 0.0 to 100.0 [%].	Set the deceleration section 2 ratio within the range of 0.0 to 100.0 [%].
0A52H	Advanced S-curve acceleration section setting over	(Acceleration section 1 ratio + Acceleration section 2 ratio) > 100.0 [%].	Set the ratio of (Acceleration section 1 ratio + Acceleration section 2 ratio) within the range of 0.0 to 100.0 [%].
0A53H	Advanced S-curve deceleration section setting over	(Deceleration section 1 ratio + Deceleration section 2 ratio) > 100.0 [%].	Set the ratio of (Deceleration section 1 ratio + Deceleration section 2 ratio) within the range of 0.0 to 100.0 [%].
0A54H	Deceleration time over in rapid stop deceleration time setting	The rapid stop deceleration time is larger than the deceleration time.	Set the rapid stop deceleration time within the range of 1 to Deceleration time setting value.
0A55H	Speed-torque control operation data incorrect setting	• Any of the devices set in the speed-torque control operation data is outside the range. • In the axes which the torque initial value selection is feedback torque when switching the control mode, the servo parameter "POL reflect setting during the PC29 torque control" is "0: Valid".	• Correct the speed-torque control operation data device. • Use the servo amplifier corresponding to the POL reflect setting during the torque control and set the POL reflect setting as "1: Invalid" at the torque control. Or set the command torque in the torque initial value selection when switching the control mode.
0A56H	Speed limit value outside range during speed-torque control	The value set in speed limit value in speed-torque control is outside the range when switching the control mode.	Set the speed limit value within the range.
0A57H	Torque limit value outside range during speed-torque control	The value set in torque limit value in speed-torque control is outside the range when switching the control mode.	The torque limit value is set to 1 to 10000 [×0.1 %].

Error code	Error name	Error details and cause	Corrective action
0A58H	Fixed position stop acceleration/deceleration time incorrect	During the fixed position stop speed control, the fixed position acceleration/deceleration time is outside the range of 1 to 8388608[ms] at the fixed positioning acceleration/deceleration time input.	Set the setting of fixed position stop acceleration/deceleration time within the range of 1 to 838868 [ms].
0A59H	Command speed outside range during continuous path control	During continuous path control, the command speed at a passing point is less than 0.	Set the speed command value within the range of 1 to Speed limit value.
0A5AH	Positioning speed error during continuous path control	During continuous path control, the positioning speed at a passing point does not reach the bias speed at start.	• Set the command speed within the range of bias speed at start or more and speed limit value or less. • Set the command speed within the range of Bias speed at start to Speed limit value.
0A5BH	Torque limit change value outside range	When the torque limit value change (D(P).CHGT, M(P).CHGT, CHGT) is requesting, the positive direction torque limit value or the negative direction torque limit value was set outside the range of 1 to 10000 [×0.1%].	When the torque limit value change is requesting, execute the changing request to set the positive direction torque limit value or the negative direction torque limit value within the range of 1 to 10000 [×0.1%].
0A5CH	The torque limit value change error to the axis not yet started	The torque limit value change request (D(P).CHGT, M(P).CHGT, CHGT) was made to the axis not yet started.	Make the torque limit value change request to the axis not yet started.
0A5DH	Under bias speed at start when changing speed	• The speed after change does not reach the bias speed at start when changing the speed. • The speed from "command speed of program × override ratio" does not reach the bias speed at start. • The speed from "speed change request × override ratio" does not reach the bias speed at start.	• Set the command speed within the range of Bias speed at start to Speed limit value. • Set "command speed of program × override ratio" and "speed of speed change request × override ratio" within the range of Bias speed at start to Speed limit value.
0A5EH	Torque limit change value incorrect during speed-torque control	The change value according to torque limit value change request (D(P).CHGT, M(P).CHGT, CHGT) during speed-torque control exceeded the torque limit value during speed-torque control.	Specify the change request within the torque limit value during the speed-torque control.
0A5FH	Command speed absolute value outside range during speed-torque control	The absolute value of command speed is outside the range of 0 to Speed limit value in speed-torque control during the speed-torque control.	Set the speed within the range of 0 to Speed limit value in speed-torque control after change.
0BD0H	Input axis phase compensation over	The phase compensation of input axis was below the minimum value (-2147483648) or above the maximum value.	• Shorten the phase compensation advance time. • Decrease the input axis speed.
0BD1H	Input axis rotation direction restriction amount over	The rotation direction restriction amount of input axis was below the minimum value (-2147483648) or above the maximum value (2147483647).	• Check the enabled direction in the rotation direction restriction setting. (The setting may be opposite.) • Check if there is an execution that the input axis moves by a wide margin oppositely to the enabled direction.
0BD2H	Input axis speed display over	The monitor speed display of input axis was below the minimum value (-2147483648) or above the maximum value (2147483647).	• If the number of decimal places is set in the input axis setting, reduce the setting value. • If the speed time unit is set in the input axis setting, Set min → sec. • Slow down the input axis.
0BD3H	Serial ABS synchronous encoder battery warning	The battery voltage dropped in the servo amplifier which connected the synchronous encoder.	Replace the battery.
0BD4H	Synchronous encoder axis control method outside range error	A value outside the range of 0 to 2 was set in "[Cd.321] Synchronous encoder axis control method" at synchronous encoder axis control request.	Set within the range of 0 to 2.
0BE4H	Main shaft clutch control setting outside range	• The value of synchronous parameter "[Pr.405] Main shaft clutch control setting" is set outside the range in synchronous controlling. • Set the synchronous parameter "[Pr.405] Main shaft clutch control setting" to No Clutch in synchronous controlling.	• Set within the range. • Do not change the setting to No Clutch.
0BF4H	Auxiliary shaft clutch control setting outside range	• The value of synchronous parameter "[Pr.422] Auxiliary shaft clutch control setting" is set outside the range in synchronous controlling. • Set the synchronous parameter "[Pr.422] Auxiliary shaft clutch control setting" to No Clutch in synchronous controlling.	• Set within the range. • Do not change the setting to No Clutch.
0C01H	Speed change ratio 1 denominator outside range	Set the value of synchronous parameter "[Pr.437] Speed change ratio 1 denominator" less than 0 in synchronous controlling.	Set within the range of 1 to 2147483647.

Error code	Error name	Error details and cause	Corrective action
0C05H	Speed change ratio 2 denominator outside range	Set the value of synchronous parameter "[Pr.493] Speed change ratio 2 denominator" less than 0 in synchronous controlling.	Set within the range of 1 to 2147483647.
0C10H	Cam No. outside range	A value outside the range of 0 to 1024 was set in synchronous parameter "[Pr.440] Cam No." in synchronous controlling.	Set within the range of 0 to 1024.
0C11H	Cam not registered	Cam data which No. has been changed does not exist in cam open area after changing synchronous parameter "[Pr.440] Cam No." in synchronous controlling.	Specify a cam No. in which cam data exists.
0C12H	Cam axis length per cycle outside range	Set the value of synchronous parameter "[Pr.439] Cam axis length per cycle" less than 0.	Set within the range of 1 to 2147483647.
0C14H	Cam axis phase compensation over	The phase compensation of cam axis was below the minimum value (-2147483648) or above the maximum value (2147483647).	• Shorten the cam axis phase compensation advance time. • Decrease the cam axis input speed.
0C15H	Cam axis length per cycle change invalid	"[Pr.439] Cam axis length per cycle" will be changed when the cam data which is stroke ratio data format and the cam data starting point is other than 0 is used in synchronous controlling.	Use the cam data which the cam data starting position is 0.
0C16H	Control mode switching request error	• Synchronous parameter "[Pr.440] Cam No." switches the control mode to speed-torque-continuous control mode for the output axis except 0 in synchronous controlling. • Switch the control mode to speed-torque-continuous operation to torque control for the output axis that is executing the synchronous control switching function."	• Set the output axis to linear cam (cam No.0) when executing the speed-torque control during advanced synchronous control. • Execute the request switching to the control mode to speed-torque-continuous operation to torque control after executed synchronous control switching function."
0C17H	Cam No. outside range in speed-torque control mode	A value other than 0 was set in output axis synchronous parameter "[Pr.440] Cam No." during speed-torque control mode.	Set the output axis to linear cam (cam No.0) when executing the speed-torque control during advanced synchronous control.
0C20H	Synchronous control change instruction outside range error	A value outside the range of 0 to 4 was set in "[Cd.407] Synchronous control change instruction" at control change request.	Set within the range of 0 to 4.
0C48H	Cam open area size over	There is not enough free area in cam open area.	Delete the unnecessary cam.
0C70H	Cam data error	Cam data is faulty.	Write the cam data again.
0C80H	Servo warning	Warning occurred in servo amplifier.	Check and correct the error details in "[Md.1019] Servo amplifier display servo error code" and "[Md.107] Parameter error No.". (Refer to the servo amplifier technology manual for the details of servo alarm.)"
0ED0H	Boot log create error	Boot log file cannot be created.	Delete unnecessary file in standard ROM. (Confirm the free space.)
0ED1H	Boot log copy error	Failed to copy to SD memory card of boot log file.	Delete unnecessary file in SD memory card. (Confirm the free space.)
0EF0H	Add-on function warning	Warning has been occurred in add-on function.	Check the detail information and refer to technology manual of add-on library that supported file name.

Minor error (1000H to 1FFFH)

Minor error details and causes, and corrective action are shown below.

Error code	Error name	Error details and cause	Corrective action
1000H	Power shutoff	• A momentary power failure has occurred. • The power supply has been shut off.	Check the power supply status.
1080H	ROM write count error	The number of writes to the flash ROM exceeded 100000 times. (Number of writes > 100000)	Replace the CPU module.
1200H	Module moderate error	A moderate error has been notified from the intelligent function module connected.	Check the detailed information (system configuration information), identify the error module, and eliminate the error cause.
1210H	Module moderate error	An inter-module synchronous signal error has been notified from the intelligent function module connected.	Check the detailed information (system configuration information), identify the error module, and eliminate the error cause.
1220H	Another CPU module moderate error	A moderate error has been notified from another CPU module.	• Check the detailed information (system configuration information), identify the error CPU module, and eliminate the error cause. • Check the mounting status and reset status of other CPU modules.
1900H	PLC ready OFF during operation	"[Rq.1120] PLC ready flag" is OFF when operating.	When all axes stopped, turn "[Rq.1120] PLC ready flag" ON.
1901H	Servo ready OFF	"[St.1075] Servo ready" was OFF when starting. • Servo amplifier power OFF • In initial processing when the servo amplifier power is ON • Servo amplifier unimplemented • Servo error occurred • Cable faulty • "[Rq.1155] Servo OFF command" is ON	Start when the "[St.1075] Servo ready" is ON.
1902H	Servo ready OFF	Servo amplifier power is OFF when controlling. (Servo not mounted status detection, cable fault, etc.)	• Turn on the power supply of the servo amplifier. Or check the connect cable to the servo amplifier. • Execute gain adjustment.
1904H	Hardware stroke limit +	At a forward direction (address increasing direction) start, the external signal FLS (upper limit switch signal) is OFF.	Perform the home position return after moving to the proximity dog ON by the JOG operation, etc.
1905H	Hardware stroke limit +	At a forward direction (address increasing direction) control, the external signal FLS (upper limit switch signal) is OFF.	Perform the home position return after moving to the proximity dog ON by the JOG operation, etc.
1906H	Hardware stroke limit -	At a reverse direction (Address decreasing direction) start, the RLS external signal (Lower limit switch) is OFF.	Perform the home position return after moving to the proximity dog ON by the JOG operation, etc.
1907H	Hardware stroke limit -	At a reverse direction (Address decreasing direction) controlling, the RLS external signal (Lower limit switch) is OFF.	Perform the home position return after moving to the proximity dog ON by the JOG operation, etc.
1908H	Stop signal ON	• "[Rq.1140] Stop command" is ON when starting. • "[Rq.1140] Stop command" is ON at the timing of home position return. • "[Rq.341] Command generation axis stop command" is ON when starting.	• Turn OFF the "[Rq.1140] Stop command" and then start it. • "[Rq.1140] Stop command" and then perform the home position return. • Turn OFF the "[Rq.341] Command generation axis stop command" and then start it.
1909H	External stop signal ON	• External stopping signal is ON when starting. • External stopping signal is ON at the timing of the home position return.	• Start as the external stop signal is OFF. • Execute the home position return as the external stop signal is OFF.
1927H	Servo error detection signal ON at start	The "[St.1068] Servo error detection" is ON when starting.	Eliminate the servo error, reset the "[St.1068] Servo error detection" by the "[Rq.1148] Servo error reset command", then start operation.
192AH	Start acceptance flag ON at start	• The "[St.1040] Start acceptance flag" is ON when starting. • The "[St.345] Command generation axis starting acceptance flag" is ON when starting.	• Start when the "[St.1040] Start acceptance flag" is OFF. • Start when the "[St.345] Command generation axis start acceptance flag" is OFF.
192DH	Rapid stop signal ON	• "[Rq.1141] Rapid stop command" is ON when starting. • "[Rq.1141] Rapid stop command" is ON at the timing of home position return. • "[Rq.342] Command generation axis rapid stop command" is ON when starting.	• Turn OFF the "[Rq.1141] Rapid stop command" and then start it. • "[Rq.1141] Rapid stop command" and then perform the home position return. • Turn OFF the "[Rq.342] Command generation axis rapid stop command" and then start it.

Error code	Error name	Error details and cause	Corrective action
192EH	PLC ready ON during deceleration	"[Rq.1120] PLC ready flag" turned from OFF to ON again during deceleration.	When all axes stopped, turn "[Rq.1120] PLC ready flag" ON.
192FH	Servo error detection signal ON during controlling	"[St.1068] Servo error detection"is ON when controlling.	Start after disposal at the servo error.
1940H	Start at home position	Start scale home position signal detection method home position return when "[St.1070] Home position return complete" and "[St.1074] External signals DOG/CHANGE" is ON.	Perform the home position return after moving to the proximity dog ON by the JOG operation, etc.
1977H	Encoder absolute position data not established	Home position return is started on using direct drive motor when the absolute position data of the encoder has not been established.	Turn the power supply of the system or servo amplifier from OFF to ON after passing the zero point of the motor by the JOG operation, etc.
1978H	Z-phase pass parameter incorrect	• When using the scale home position signal detection method home position return or the dogless home position reference method home position return (operation A), the servo parameter PC17 is other than "Pass Z-phase After AC-ON". • When using the dogless home position reference method home position return (operation B), the servo parameter PC17 is other than "Not Pass Z-phase After AC-ON".	• Set "Pass Z-phase After AC-ON" to the servo parameter PC17. • Set "Not Pass Motor Z-phase After AC-ON" to the servo parameter PC17. • When changing PC17, once the power supply of servo amplifier is turned OFF after changing parameter and then turned ON again.
1979H	Home position return method incorrect error	Home position return is started with the home position return method which is not supported by the connected servo amplifier.	Change to the home position return method which is supported by the connected servo amplifier.
197AH	Home position return zero not passed	ZCT unset The "[St.1066] zero pass" turned off at the re-movement at the home position return for ZCT unset proximity dog method, count method limit switch combined method, or start in the home position return for data set method.	Perform the home position return when the "[St.1066] Zero pass" is ON.
197BH	Home position return complete signal ON	The "[St.1070] Home position return complete" turned on at the home position return of proximity dog method, dog cradle method, stopper method or dogless home position signal reference method.	• For proximity dog method dog cradle method stopper method: Return to a point before the proximity dog signal ON by JOG operation or positioning operation etc. and perform the home position return. • For dogless home position signal reference method: Return to a point before the proximity dog signal ON by JOG operation or positioning operation etc. and perform the home position return.
197CH	All axes rapid stop during home position return	During a home position return, all axes rapid stop operation was performed in the test mode of MT Developer2.	• In case of proximity dog method, return to a point before the proximity dog signal ON using JOG operation or positioning operation, and perform the home position return again. • In case of proximity dog is off in count method, return to a point before the proximity dog signal ON using JOG operation or positioning operation, and perform the home position return again.
197DH	External DOG signal ON during home position return	The external dog (proximity dog) signal is ON when the home position return starting.	Perform the home position return after moving to the proximity dog ON by the JOG operation, etc.
197EH	An encoder initial communication error at turning ON servo amplifier power supply	A communication error between the servo amplifier and encoder occurred at the turning on servo amplifier power supply.	• Check the motor and encoder cables. • Execute a home position return at home position return requirement ON.
1980H	JOG speed outside range	The set JOG speed is 0.	Set within the range of 1 to JOG speed limit value.
198DH	Manual pulse generator unset	The unset manual pulse generator axis is started.	Start the set manual pulse generator axis.
198EH	Manual pulse generator multiple start error	The same manual pulse generator started during the manual pulse generator operation (decelerating).	Start the manual pulse generator after checking the manual pulse generator stopped.
198FH	Manual pulse generator control axis unset error	• "Number setting register of the axis to be controlled in [Cd.1098] manual pulse generator 1" is 0. • "Number setting register of the axis to be controlled in [Cd.1099] manual pulse generator 2" is 0. • "Number setting register of the axis to be controlled in [Cd.1100] manual pulse generator 3" is 0.	• Set the "Number setting register of the axis to be controlled in [Cd.1098] manual pulse 1". • Set the "Number setting register of the axis to be controlled in [Cd.1099] manual pulse generator 2". • Set the "Number setting register of the axis to be controlled in [Cd.1100] manual pulse generator 3".

Error code	Error name	Error details and cause	Corrective action
1993H	Software stroke limit +	• The feed current value exceeded the stroke limit range at start. • The feed current value exceeded the stroke limit range when controlling. Only the axes which exceeded the stroke limit range are stored in case of the circular interpolation/helical interpolation. All of the interpolations are stored in case of the linear interpolation.	• Set within the stroke range by the JOG operation. Or set within the stroke range by the home position return or current value change. • Correct the stroke limit range or movement amount setting so that positioning control is within the range of the stroke limit.
1995H	Software stroke limit -	• The feed current value is lower than the stroke lower limit value at start. • The feed current value is lower than the stroke lower limit value when controlling. Only the axes which exceeded the stroke limit range are stored in case of the circular interpolation/helical interpolation. All of the interpolations are stored in case of the linear interpolation.	• Set within the stroke range by the JOG operation. Or set within the stroke range by the home position return or current value change. • Correct the stroke limit range or movement amount setting so that positioning control is within the range of the stroke limit.
1997H	Current value change outside range	The current value was changed outside the range of 0 to 35999999 ($\times 10^{-5}$ [degree]) for the degree axis.	Operate within the range of 0 to 35999999 ($\times 10^{-5}$[degree]).
19A1H	PLC ready OFF start	The "[Rq.1120] PLC ready flag" or the "PCPU preparation completion flag" is OFF.	• Set the Motion CPU to RUN. • Turn the "[Rq.1120] PLC ready flag" on.
19A4H	ABS direction setting error during degree	When software stroke limit is invalid, the value outside the range has been set to "ABS direction setting device during degree".	Set the ABS direction setting device during degree within the range.
19A6H	Start error during home position return incomplete	The "[St.1069] Home position return request" is ON if the "Servo program not executed" is selected in the operation setting when the home position is not completed.	• After the home position return is accomplished, execute the servo program. • For systems that allow the execution of the servo program even if a "[St.1069] Home position return request" is ON, set "Operational setting for home position return incomplete" of the home position return data setting to "Execute servo program".
19DFH	Stop function valid setting error for backing side	Enable the stop function valid setting to backing side of servo parameter (PT12: TOP1 pressure control function selection 1).	Disable the stop function valid setting for backing side.
19E0H	Pressure control exceed last address error	• The difference between last address and home position exceed motor encoder pulse unit ± (2^{-31} pulse to motor encoder for 10 rev.). • The difference between last address and actual current value exceed motor encoder pulse unit (2^{-31}pulse).	Correct the value of last address to make it within the setting range of limit value.
19E1H	Pressure control start error	Necessary setting value for pressure control starting is outside the range.	Correct the setting value.
19E2H	Command speed acceleration/deceleration time outside range	• The command speed acceleration time of the speed-torque control data is outside the range 0 to 8388608 [ms]. • The command speed deceleration time of the speed-torque control data is outside the range 0 to 8388608 [ms].	• Set the command speed acceleration time of the speed-torque control data within the range 0 to 8388608 [ms]. • Set the command speed deceleration time of the speed-torque control data within the range 0 to 8388608 [ms].
19E3H	Command torque time constant outside range	• The command torque time constant (positive direction) of the speed-torque control data is outside the range of 0 to 8388608 [ms]. • The command torque time constant (negative direction) of the speed-torque control data is outside the range of 0 to 8388608 [ms].	• Set the command torque time constant (positive direction) of the speed-torque control data within the range of 0 to 8388608 [ms]. • Set the command torque time constant (negative direction) of the speed-torque control data within the range of 0 to 8388608 [ms].
19E6H	Target position change request prohibited acceleration/deceleration method	The target position change request (CHGP) is executed to the program where the following acceleration/deceleration system is set. • FIN acceleration/deceleration • Advanced S-curve acceleration/deceleration	• Do not execute the target position change to the program where the FIN acceleration/deceleration or the advanced S-curve acceleration/deceleration is set. • Set the acceleration/deceleration system of the parameter block or the servo program to the trapezoid/S-curve acceleration/deceleration.
19E7H	Unsupported stopper control	Switching to the stopper control was requested to the servo amplifier which unsupported to the stopper control.	Use the available stopper control for servo amplifier.
19E8H	Stroke limit invalid axis circular/helical interpolation execution error	The circular interpolation or helical interpolation was started in the invalid axis of stroke limit.	Make the stroke limit valid for the control unit degree axis starts the circular interpolation or helical interpolation.

Error code	Error name	Error details and cause	Corrective action
19E9H	Speed-position control restart error	The speed-position switching control restart (VPSTART) was performed, although it was not after the stop during operation of the speed-position switching control.	Do not restart except for the stop during speed-position switching control.
19EAH	Fixed position stop speed control start error	Servo axis: • The speed control with fixed position stop was executed for the axis which the unit has been set other than [degree]. • The speed control with fixed position stop was executed for the axis which the stroke limit has been set other than [degree]. Command generation axis: • The speed control with fixed position stop was executed for the axis which the "[Pr.346] Command generation axis 1 cyclic length" is 0.	Servo axis: • Set the unit [degree] for the axis for which fixed position stop speed control is started. • Set the stroke limit to invalid "(lower stroke limit value) = (upper stroke limit value)" for the axis for which fixed position stop speed control is started. Command generation axis: • Set the length per cycle other than 0 for fixed position stop speed control starting axis in command axis.
19EBH	Speed control (Ⅱ) execution impossible	The operation disable instruction (VVF/VVR) was started in an axis that does not support VVF/VVR instructions.	The VVF/VVR instruction cannot be started in an axis that does not support VVF/VVR instructions.
19ECH	External input signal setting error	The positioning control which uses the external input signal was executed for the axis which has not set the external input signal in the system settings.	Set the external input signal in the system setting.
19EDH	Other axes software stroke limit outside range error detection	The feed current value of another axis exceeded the stroke limit value during the circular/helical interpolation or simultaneous manual pulse generator operation. (For detection of other axis errors).	Correct the setting movement amount or the stroke limit range so that the positioning control is within the range of stroke limit.
19EEH	Setting movement amount software stroke limit outside range	The preset movement amount exceeded the stroke limit range when speed-position switching signal (CHANGE) is input.	Correct the setting movement amount or the stroke limit range so that the positioning control is within the range of stroke limit.
19EFH	Interpolation command incorrect after skip during continuous path control	• The next interpolation is ABS arc or ABS helical interpolation upon skip execution under continuous path control. • ABS arc or ABS helical interpolation is executed with passing through only the incremental positioning point after skip is executed under continuous path control.	If ABS arc or ABS helical interpolation is designated at a point after the skip designation point, set an ABS linear interpolation point in the interval.
19FAH	No specified servo program	The servo program set in servo program start does not exist.	Set the correct servo program No.
19FBH	Axis No. unmatch error	The axis No. set in servo program start does not match to axis No. set in servo program.	Set the correct axis No.
19FCH	Servo program instruction code error	• The device number of the device that is set in the servo program is outside the range. • An instruction that cannot be used in D(P).SVSTD/ M(P).SVSTD instructions is set.	• Revise the program so that the device number is correct, or revise the CPU parameter device numbers so they are within the range. • Set the correct instruction code.
19FDH	Servo program No. outside range	Servo program No. is outside the range of 0 to 4095.	Set the servo program No. within the range of 0 to 4095.
19FEH	Command generation axis start error	The operation disable instruction (VPF, VPR, VPSTART, ZERO, VVF, VVR, OSC) was started in the command generation axis.	Correct the servo program.
19FFH	Axis No. setting error	• An unused axis is set in the servo program. • The axis No. set in servo program is outside the range. Or the axis No. set in servo program is overlapping.	• Set an axis No. that is being used. • Correct the axis No. of servo program.
1A17H	Circular error excessive	The difference between the end point address and ideal end point is outside the allowable error range for circular interpolation.	Correct the address of servo program.
1A18H	Software stroke limit +	Positioning is outside the range of stroke limit which has exceeded by software upper stroke limit.	Execute positioning within the range of stroke limit.
1A1AH	Software stroke limit -	Positioning is outside the range of stroke limit which has exceeded by software lower stroke limit.	Execute positioning within the range of stroke limit.
1A23H	Command speed setting error	The specified command speed is less than 0.	Set the command speed within the range of 1 to Speed limit value.
1A27H	Auxiliary point setting error	The address that does not generate an arc is set at the auxiliary point-specified/auxiliary point-specified helical interpolation. (Start point = Auxiliary point)	Correct the address of servo program.
1A28H	Auxiliary point setting error	The address that does not generate an arc is set at the auxiliary point-specified/auxiliary point-specified helical interpolation. (End point = Auxiliary point)	Correct the address of servo program.

Error code	Error name	Error details and cause	Corrective action
1A29H	Auxiliary point setting error	The address that does not generate an arc is set at the auxiliary point-specified/auxiliary point-specified helical interpolation. (Three points are on one linear.)	Correct the address of servo program.
1A2AH	Auxiliary point setting error	• The auxiliary point address is outside the setting range at the positioning start for absolute method. • The auxiliary point address is set to -2147483648 (H80000000) at the positioning start for incremental method. • The start point address + auxiliary point address is outside the range of -2147483648 to 2147483647 at the positioning start for incremental method.	• Set the auxiliary point address within the range of 0 to 35999999 for the axis (unit: degree). • Set the auxiliary point address within the range of 0 to ±(214748364748-1). • Set the start point address + auxiliary point address within the range of -2147483648 to 2147483647."
1A2BH	End point setting error	The circular interpolation/helical interpolation is not to be circular. (Start point = End point)	Correct the address of servo program.
1A2DH	Central point setting error	The address that does not generate an arc is set at the central point specified/central point specified helical interpolation. (Start point = Central point)	Correct the address of servo program.
1A2EH	Central point setting error	The address that does not generate an arc is set at the central point specified/central point specified helical interpolation. (End point = Central point)	Correct the address of servo program.
1A2FH	Central point setting error	• The central point address is outside the setting range at the positioning start for absolute method. • The central point is set to -2147483648 (H80000000) at the positioning start for incremental method. • The start point address + central point address is outside the range of -2147483648 to 2147483647 at the positioning start for incremental method.	• Set the central point address within the range of 0 to 35999999 for the axis (unit: degree). • Set the central point address within the range of 0 to ± (214748364748-1). • Set the start point address + central point address within the range of -2147483648 to 2147483647.
1A30H	Address outside range	The movement amount is set to -2147483648 (H80000000) at the positioning start for incremental data method.	The setting of movement amount is within the range of 0 to ±(2147483648-1).
1A31H	Address outside range	The address is outside the setting range at the positioning start for absolute data method.	Set the address within the range of 0 to 35999999 for the axis (unit: degree).
1A32H	Radius outside range	• The radius is outside the setting range at the positioning control for absolute method. • The radius is set to 0 or a negative number setting at the positioning start for incremental method.	• Set the radius within the range of 0 to 35999999 for the axis (unit: degree). • Set the radius within the range of 0 to ±(2147483648-1).
1A36H	Pitch number outside range	The number of pitches specified in helical interpolation is outside the range of 0 to 999.	Set the specified pitch number within the range of 0 to 999.
1A4FH	START instruction setting error	• Servo program specified with the START instruction does not exist. • There is a "START" instruction in the specified servo program. • The starting axis of the specified servo program is overlapping. • The specified servo program start axis is overlapping. • Self program No. is set in simultaneous start program No. • The real axis program and the command axis program exist together. • Start program does not exist. • All the specified program No. is -1.	• Create the servo program specified with the START instruction. • Delete the servo program specified with the START instruction. • Do not overlap the starting axis. • Do not overlap the simultaneous start program No. • Do not set self program No. in simultaneous start program No. • Please change the setting so that the real axis program and the command axis program do not exist together. • Set to start the program existed. • Do not set all the simultaneous start program number to -1.
1A50H	Point setting error	No point specification exists in the instruction during the continuous trajectory control.	Specify a point between the CPSTART and CPEND.
1A51H	Reference axis speed setting error	The axis except for interpolation axis is set as the reference axis at the linear interpolation of the reference axis speed specification method.	Set the reference in the interpolation axis.
1A52H	High-speed oscillation command amplitude error	Unable to start because the amplitude commanded in the high-speed oscillation function is outside the range of 1 to 2147483647.	Start after setting the command amplitude within the range of 1 to 2147483647.
1A53H	High-speed oscillation start angle error	Unable to start because the starting angle commanded in the high-speed oscillation function is outside the range of 0 to 3599 (× 0.1 [degree]).	Start after setting the starting angle within the range of 0 to 3599 (× 0.1 [degree]).
1A54H	High-speed oscillation frequency error	Unable to start because the frequency commanded in the high-speed oscillation function is outside the range of 1 to 5000 [CPM].	Start after setting the frequency within the range of 1 to 5000 [CPM].

Error code	Error name	Error details and cause	Corrective action
1A55H	Radius setting error	The address that does not generate an arc is set at the R (radius) specified/R (radius) specified helical interpolation. (Relationships among the start point radius and end point.)	Correct the address of servo program.
1A56H	Reference axis movement amount 0	The movement amount of the reference axis is set at "0" in the linear interpolation for reference axis specification.	Set the axis of which the movement amount is not 0 to a reference axis.
1A57H	Movement amount insufficient during speed-position switching control/count method home position return	Overrun occurred because preset movement amount is less than The deceleration distance at The proximity dog signal input during The speed-position switching signal (Change) input or The home position return of count method during The speed-position switching control.	• Set the speed so that an overrun will not occur. • Set the setting movement amount so that an overrun will not occur.
1A58H	Movement amount insufficient	• During control, an overrun occurred because the deceleration distance for output speed was not reached upon detection of the last positioning address. • During acceleration/deceleration time change control, an overrun occurred because the deceleration distance for output speed was not reached upon detection of the last positioning address.	• Set the speed/setting movement amount so that an overrun will not occur. • Set the speed/setting movement amount/deceleration time so that an overrun will not occur.
1A59H	Command address outside range during position tracking control	When the control unit is "degree" set the command address within the range of 0 to 35999999 during position tracking.	If the control unit is degree, set the command address in the range of 0 to 35999999.
1A5AH	Stroke limit outside range position tracking control	The command address for the position tracking control exceeded the stroke limit range.	Set the address of stroke limit range.
1A5BH	Command address outside range during fixed position stop speed control	Servo axis: • During speed control with fixed position stop, the command address for the fixed position stop command ON exceeds the range of 0 to 35999999. Command generation axis: • During speed control with fixed position stop, the command address for the fixed position stop command ON exceeds the range of 0 to (Cam axis length per cycle-1)	Servo axis: • Set the command address within the 0 to 35999999 range. Command generation axis: • Set the command address within range 0 to (Cam axis length per cycle-1).
1A5CH	Target position outside range	Executed the target position change request (CHGP) of address specified so that the changed target position is outside the range of 0 to 35999999 for the axis (unit: degree).	Set the target position after change in the range of 0 to 35999999 if the change request of address specified for the axis (unit: degree).
1A5DH	Movement amount insufficient during target position change	Overrun occurred since the target position after changing was less than the deceleration distance at target position change request (CHGP).	• Set the speed so that an overrun will not occur. • Specify the target position so that an overrun will not occur.
1A5EH	Stroke limit outside range target position change	The target position after changing has exceeded the range of stroke limit at target position change request (CHGP).	Set the target position after changing or stroke range so that the positioning control is within the range of stroke limit.
1A5FH	Reference axis/long axis movement amount error after target position change	In reference axis-specified linear interpolation or the long axis-specified linear interpolation, the movement amount of the reference axis or the long axis after the target position change request (CHGP) is 0.	Set the target position after change with the Reference axis or Long axis movement amount after the target position change is not 0.
1A9FH	Bias speed at start setting outside range	• At JOG start, the command speed is outside the range of Bias speed at start to Speed limit value. • The Bias speed at start is larger than the speed limit value.	• Set the command speed within the range of Bias speed at start to Speed limit value. • Set the Bias speed at start to a value smaller than the speed limit value.
1B02H	Home position address setting error	The home position address is outside the range of 0 to 35999999 ($\times 10^{-5}$[degree]) at degree axis.	Set the home position within the range of 0 to 35999999.
1B04H	Home position return speed error	The home position return speed is outside the range of 1 to Speed limit value.	Set the home position return value less than the speed limit value.
1B05H	Home position return speed error	The home position return speed is outside the range of Bias speed at start to Speed limit value.	Set the home position return speed within the range of Bias speed at start to Speed limit value.
1B07H	Creep speed error	The creep speed is outside the range of 1 to Home position return speed.	Set the creep speed below the home position return speed.
1B08H	Creep speed error	The creep speed is outside the range of Bias speed at start to Speed limit value.	Set the creep speed within the range of bias speed at speed limit value start.
1B0AH	Movement amount setting error after proximity dog ON	The movement amount after the proximity dog ON is outside the range of 0 to 2147483647 ($\times$ unit).	Set the movement amount after the proximity dog ON within the range of 0 to 2147483647.
1B0DH	Home position return torque limit value error	The creep speed torque limit value is outside the range of 1 to 10000 [$\times$ 0.1%].	Set the creep speed torque limit value within the range of 1 to 10000.

Error code	Error name	Error details and cause	Corrective action
1B14H	Standby time after pulse conversion module clear signal output outside range error	Standby time after pulse conversion module clear signal output is outside the range of 1 to 1000[ms].	Set the standby time after pulse conversion module clear signal within the range of 1 to 1000.
1B3EH	Parameter block No. outside range	Parameter block No. is outside the range of 1 to 64.	Set the parameter block No. within the range of 1 to 64.
1B3FH	Dwell time error during home position return retry	The dwell time is outside the range of 0 to 5000[ms] during the home position return retry.	Set the dwell time within the range of 0 to 5000 during the home position return retry.
1BA0H	Input axis type setting outside range	The value of input axis parameter "[Pr.300] Servo input axis type" and "[Pr.320] Synchronous encoder axis type" was set outside range.	Set "[Pr.300] Servo input axis type", "[Pr.320] Synchronous encoder axis type" within the range.
1BA1H	Input axis module setting outside range	The setting value of input axis parameter "[Pr.321] Synchronous encoder axis unit setting" is outside the setting range.	Set the "[Pr.321] Synchronous encoder axis unit setting" within the range.
1BA2H	Input axis module change denominator outside range	The value of input axis parameter "[Pr.323] Synchronous encoder axis unit conversion denominator" is set less than 0.	Set the "[Pr.323] Synchronous encoder axis unit conversion denominator" within the range of 1 to 2147483647.
1BA3H	Input axis length per cycle outside range	The value of input axis parameter "[Pr.324] Synchronous encoder axis length per cycle" is set less than 0.	Set the "[Pr.324] Synchronous encoder axis length per cycle" within the range of 1 to 2147483647.
1BA4H	Input axis smoothing time constant outside range	The value of input axis parameter "[Pr.301] Servo input axis smoothing time constant" and "[Pr.325] Synchronous encoder axis smoothing time constant" were set outside the range of 0 to 5000.	Set the "[Pr.301] Servo input axis type smoothing time constant", "[Pr.325] Synchronous encoder axis smoothing time constant" within the range of 0 to 5000.
1BA5H	Input axis rotation direction restriction setting outside range	The value of "[Pr.304] Servo input axis rotation direction restriction" and "[Pr.328] Synchronous encoder axis rotation direction restriction" were set outside the range of 0 to 2.	Set the "[Pr.304] Servo input axis rotation direction restriction", "[Pr.328] Synchronous encoder axis rotation direction restriction" within the range of 0 to 2.
1BA6H	Input axis module change overflow	The overflow of internal operation (unit conversion numerator/unit conversion denominator) occurred because the unit conversion ratio of input axis is large.	• Reduce the unit conversion ratio of input axis (unit conversion numerator/unit conversion denominator). • Slow down the input axis.
1BA7H	Servo input axis speed-position switching control start impossible	Start speed-position switching control when the status of "[Rq.1152 Feed current value update request command]" is OFF, or when the input axis parameter "[Pr.300] Servo input axis type" is the feed/real current value.	• Set the [Pr.300] "Servo input axis type" as the servo command value or the feedback value. • Start the speed-position switching control after setting the "[Rq.1152] current feed value update command" to ON.
1BA8H	Serial ABS synchronous encoder communication error	• Encoder hardware error. • Encoder cable is open. • The synchronous encoder specified in system setting differs from the synchronous encoder actually connected.	• Check (module change) the encoder. • Check the encoder cable. • Set the synchronous encoder actually connected in the system setting.
1BA9H	Serial ABS synchronous encoder battery error	No battery in the servo amplifier which connected the synchronous encoder, or the battery cable is disconnected.	Replace the battery and check the servo amplifier (module replace).
1BAAH	Synchronous encoder via servo amplifier invalid error	The axis set in synchronous encoder via servo amplifier does not support the synchronous encoder via servo amplifier.	Connect the servo amplifier which supports the synchronous encoder via servo amplifier.
1BABH	Serial ABS synchronous encoder initial communication error	• Encoder hardware is failure when the multiple CPU system power is ON. • The encoder cable is disconnected when the multiple CPU system power is ON. • The synchronous encoder specified in system setting differs from the synchronous encoder actually connected when the multiple CPU system power is ON.	• Check (module change) the encoder. • Check the encoder cable. • Set the synchronous encoder connected actually in the system setting.
1BDEH	Slave CPU synchronous encoder transfer invalid	The axis that input axis parameter "[Pr.320] Synchronous encoder axis type" has been set cannot be connected in master CPU.	Keep the connection status for the input axis of the specified master CPU.
1BDFH	Servo input axis speed control (Ⅱ) start impossible	Start speed control (Ⅱ) when input axis parameter "[Pr.300] Servo input axis type" is not invalid.	Set the "[Pr.300] Servo input axis type to be invalid". (Use the speed-torque control function when operating the speed control that does not include positioning loops.)

Error code	Error name	Error details and cause	Corrective action
1BE0H	Main input axis number outside range	• The setting value of synchronous parameter "[Pr.400] Main input axis number" is outside the setting range. • The same servo input axis number as the output axis is set in the synchronous parameter "[Pr.400] Main input axis number".	• Set within the range. • Set the servo input axis number that is different from the output axis.
1BE1H	Sub input axis number outside range	• The setting value of "[Pr.401] Sub input axis number" is outside the setting range. • The same servo input axis number as the output axis is set in the synchronous parameter "[Pr.401] Sub input axis number".	• Set within the range. • Set the servo input axis number that is different from the output axis.
1BE2H	Main shaft gear denominator outside range	Set the value of synchronous parameter "[Pr.404] Main shaft gear denominator" less than 0.	Set within the range of 1 to 2147483647.
1BE3H	Main shaft gear operation overflow	The input value is overflowed (sign reverse) because the gear ratio of main shaft gear is large.	• Reduce the absolute value of synchronous parameter "[Pr.403] Main shaft gear numerator". • Increase the synchronous parameter "[Pr.404] Main shaft gear denominator". • Slow down the input axis speed.
1BE4H	Main shaft clutch control setting outside range	The value of synchronous parameter "[Pr.405] Main shaft clutch control setting" is set outside range.	Set within the range.
1BE5H	Main shaft clutch reference address setting outside range	A value outside the range of 0 to 1 was set in synchronous parameter "[Pr.406] Main shaft clutch reference address setting".	Set within the range of 0 to 1.
1BE6H	Main shaft clutch smoothing method outside range	A value outside the range of 0 to 5 was set in synchronous parameter "[Pr.411] Main shaft clutch smoothing system".	Set within the range of 0 to 5.
1BE7H	Main shaft clutch smoothing time constant outside range	A value outside the range of 0 to 5000 was set in synchronous parameter "[Pr.412] Main shaft clutch smoothing time constant".	Set within the range of 0 to 5000.
1BE8H	Composite main shaft gear operation overflow	The composite value is overflowed (sign reverse) because the input values of main input axis and sub input axis are large.	Lower the input values of main input axis and sub input axis.
1BF0H	Auxiliary shaft number outside range	• The setting value of synchronous parameter "[Pr.418] Auxiliary shaft number" is outside the setting range. • The same servo input axis number as the output axis is set in the synchronous parameter "[Pr.418] Auxiliary shaft number".	• Set within the range. • Do not set the same servo input axis number with output axis.
1BF2H	Auxiliary shaft gear denominator outside range	Set the value of synchronous parameter "[Pr.421] Auxiliary shaft number denominator" less than 0.	Set within the range of 1 to 2147483647.
1BF3H	Auxiliary shaft gear operation overflow	The input value is overflowed (sign reverse) because of the gear ratio of auxiliary shaft gear is large.	• Reduce the absolute value of synchronous parameter "[Pr.420] Main shaft gear numerator ". • Increase the synchronous parameter "[Pr.421] Main shaft gear denominator". • Slow down the input axis speed."
1BF4H	Auxiliary shaft clutch setting outside range	The value of synchronous parameter "[Pr.422] Auxiliary shaft clutch control setting" is outside range.	Set within the range.
1BF5H	Auxiliary shaft clutch reference address setting outside range	A value outside the range of 0 to 1 was set in synchronous parameter "[Pr.423] Auxiliary shaft clutch reference address setting".	Set within the range of 0 to 1.
1BF6H	Auxiliary shaft clutch smoothing method outside range	A value outside the range of 0 to 5 was set in synchronous parameter "[Pr.428] Auxiliary shaft clutch smoothing system".	Set within the range of 0 to 5.
1BF7H	Auxiliary shaft clutch smoothing time constant outside range	A value outside the range of 0 to 5000 was set in synchronous parameter "[Pr.429] Auxiliary shaft clutch smoothing time constant".	Set within the range of 0 to 5000.
1BF8H	Composite auxiliary shaft gear operation overflow	The composite value is overflowed (sign reverse) because the input values of main shaft and auxiliary shaft are large.	Lower the input values of main shaft and auxiliary shaft.
1C00H	Speed change gear 1 arrangement outside range	A value outside the range of 0 to 3 was set in synchronous parameter "[Pr.434] Speed change gear 1 arrangement".	Set within the range of 0 to 3.
1C01H	Speed change ratio 1 denominator outside range	Set the value of synchronous parameter "[Pr.437] Speed change ratio 1 denominator" less than 0.	Set within the range of 1 to 2147483647.

Error code	Error name	Error details and cause	Corrective action
1C02H	Speed change gear 1 smoothing time constant outside range	A value outside the range of 0 to 5000 was set in synchronous parameter "[Pr.435] Speed change gear 1 smoothing time constant".	Set within the range of 0 to 5000.
1C03H	Speed change gear 1 operation overflow	The input value is overflowed (sign reverse) because of the speed change ratio of speed change gear 1 is large.	• Reduce the absolute value of synchronous parameter "[Pr.436] Speed change ratio 1 numerator". • Increase the synchronous parameter "[Pr.437] Speed change ratio 1 denominator". • Slow down the input axis speed.
1C04H	Speed change gear 2 arrangement outside range	A value outside the range of 0 to 3 was set in synchronous parameter "[Pr.490] speed change gear 2 arrangement".	Set within the range of 0 to 3.
1C05H	Speed change ratio 2 denominator outside range	Set the value of synchronous parameter "[Pr.493] Speed change ratio 2 denominator" less than 0.	Set within the range of 1 to 2147483647.
1C06H	Speed change gear 2 smoothing time constant outside range	A value outside the range of 0 to 5000 was set in synchronous parameter "[Pr.491] Speed change gear 2 smoothing time constant".	Set within the range of 0 to 5000.
1C07H	Speed change gear 2 operation overflow	The input value is overflowed (sign reverse) because of the speed change ratio of speed change gear 2 is large.	• Reduce the absolute value of synchronous parameter "[Pr.492] Speed change ratio 2 numerator ". • Increase the synchronous parameter "[Pr.493] Speed change ratio 2 denominator". • Slow down the input axis speed.
1C08H	Speed change gear overlapping arrangement disable	The setting value of synchronous parameter "[Pr.434] Speed change gear 1 arrangement" and "[Pr.490] Speed change gear 2 arrangement" are overlapping.	Set the different arrangement for the synchronous parameter "[Pr.434] Speed change gear 1 arrangement" and "[Pr.490] Speed change gear 2 arrangement"
1C10H	Cam No. outside range	A value outside the range of 0 to 1024 was set in synchronous parameter "[Pr.440] Cam No.".	Set within the range of 0 to 1024.
1C11H	Cam not registered	Cam data which the No. is specified by synchronous parameter "[Pr.440] Cam No." does not exist in cam open area.	Specify a cam No. in which cam data exists.
1C12H	Cam axis length per cycle outside range	Set the value of synchronous parameter "[Pr.439] Cam axis length per cycle" less than 0.	Set within the range of 1 to 2147483647.
1C13H	Output axis smoothing time constant outside range	A value outside the range of 0 to 5000 was set in synchronous parameter "[Pr.447] Output axis smoothing time constant".	Set within the range of 0 to 5000.
1C1FH	Synchronous control parameter block No. outside range	A value outside the range of 0 to 64 was set in synchronous parameter "[Pr.448] Synchronous control parameter block No.".	Set within the range of 1 to 64.
1C20H	The setting method of current value per cycle after main shaft gear outside range	A value outside the range of 0 to 2 was set in synchronous parameter "[Pr.460] Current value per cycle after main shaft gear setting method".	Set within the range of 0 to 2.
1C21H	The initial value of current value per cycle after main shaft gear outside range	A value outside the range of 0 to (Cam axis length per cycle-1) was set in synchronous parameter "[Pr.465] Current value per cycle after main shaft gear".	Set in the range of 0 to (Cam axis length per cycle-1).
1C22H	The setting method of current value per cycle after auxiliary shaft gear outside range	A value outside the range of 0 to 2 was set in synchronous parameter "[Pr.461] Current value per cycle after auxiliary shaft gear setting method".	Set within the range of 0 to 2.
1C23H	The initial setting value of current value per cycle after auxiliary shaft gear outside range	A value outside the range of 0 to (Cam axis length per cycle-1) was set in synchronous parameter "[Pr.466] Initial setting value of the current value per cycle after auxiliary shaft gear".	Set in the range of 0 to (Cam axis length per cycle-1).
1C24H	Cam axis position recovery target outside range	A value outside the range of 0 to 2 was set in synchronous parameter "[Pr.462] Cam axis position recovery target".	Set within the range of 0 to 2.
1C25H	Cam reference position setting method outside range	A value outside the range of 0 to 2 was set in synchronous parameter "[Pr.463] Cam reference position setting method"	Set within the range of 0 to 2.

Error code	Error name	Error details and cause	Corrective action
1C26H	Setting method of cam axis current value per cycle outside range	• A value outside the range of 0 to 3 was set in synchronous parameter "[Pr.464] Cam axis current value per cycle setting method". • The "3: Current value per cycle after auxiliary shaft gear" was set when the auxiliary shaft does not exist.	• Set within the range of 0 to 3. • Set other than "3: Current value per cycle after auxiliary shaft gear" if auxiliary shaft does not exist.
1C27H	Initial setting value of cam axis current value per cycle outside range	A value outside the range of 0 to (Cam axis length per cycle-1) was set in "[Pr.468] Initial setting value of the cam axis current value per cycle".	Set in the range of 0 to (Cam axis length per cycle-1).
1C28H	Cam axis current value per cycle recovery disable	If the synchronous parameter "[Pr.462] Cam axis position recovery target" is "0 : Cam axis current value per cycle recovery", cam axis current value per cycle for feed current value cannot be recovered when synchronous control starting. (Occurred in the cam pattern of oscillate.)"	• Start the synchronous control after set a current value that is within the reciprocated cam pattern stroke. • Set a reference position that is within the reciprocated cam pattern stroke.
1C29H	Cam axis current feed value cannot be restored	If the synchronous parameter "[Pr.462] Cam axis position recovery target" is "2: Cam axis feed current value recovery", the difference (pulse command unit) between the restored cam axis feed current value and the feed value during synchronous control start exceeds the servo parameter "in-position width" and cannot be restored.	• Start the synchronous control after set a current value that the recovery cam axis feed current value is calculated in cam position calculation function. • Set the setting value of servo parameter "In-position range" to a large value when it is very small like 0."
1C80H	Servo error	Error occurred in servo amplifier.	Check and correct the error details in "[Md.1019] Servo amplifier display servo error No." and "[Md.107] Parameter error No.". (Refer to the servo amplifier technology manual for the details of servo alarm.)
1C81H	Communication retry times error	The communication retry count error between motion controller and servo amplifier was detected.	• Check the SSCNETⅢ cable. (Connection error/damage check) • Replace the servo amplifier of the alarm (communication error) occurred. • Replace the module.
1C82H	Watchdog counter receive error	The communication retry count error between motion controller and the watchdog counter of the servo amplifier was detected.	Replace the servo amplifier of the watchdog error occurred
1C83H	Unsupported operation cycle	Set the setting value of operation cycle which does not support the amplifier.	Please set the supported operation cycle, and switch on the power supply again or reset the multiple CPU system.
1C90H	Number of master axis error	The number of master axis is exceeding the possible setting number in the "Communication setting among drivers (PD15)" of servo parameters.	Check the "Communication setting among drivers (PD15)" of servo parameters and set the master axis less than 4 axes in SSCNETⅢ line, less than 8 axes in SCNET Ⅲ/H line.
1C91H	Master axis No. error	The self axis is set in "Master axis No. selection 1 (PD20) at communication slave setting among drivers" and PD21 to PD23 of servo parameters.	Check "Master axis No. selection 1 (PD20) at communication slave setting among drivers" and PD21 to PD23 of servo parameter in slave axis.
1C92H	Master axis specification error	Master axis which supports the slave axis has not been set.	Check "Master axis No. selection 1 (PD20) at communication slave setting among drivers" and PD21 to PD23 of servo parameter in slave axis.
1C93H	Communication among drivers setting error	For the axes set in the master/slave, a servo amplifier that is not compatible with the driver communication has been connected.	Check the master/slave setting and the connected servo amplifier.
1C95H	Communication operation cycle among drivers setting error	Set the master/slave when the operation cycle is set as 0.222ms.	For SSCNET Ⅲ line, please set the operation cycle more than 0.444ms.
1CB0H	Connected servo amplifier station number overlapping error	• The settings of the servo amplifier station No. (axis selection rotary switch) are overlapping in the same system of SSCNETⅢ. • The axis setting equal to the number of used axes set in the servo amplifier is not set. • Checked the data error of SSCNETⅢ communication.	• Set the settings of the servo amplifier station No. (axis selection rotary switch) so that they are not overlapping in the same system of SSCNETⅢ. • Set the axes equal to the number of used axes set in the servo amplifier. • Check the SSCNETⅢ cable. (Connection error/damage check).
1CB1H	Connected servo amplifier type unmatch error	The series of the servo amplifier specified in the system setting differs from the series of the servo amplifier installed.	Set the series of the actually connected servo amplifier.
1CBEH	The optical hub unit connection error	• Connection number of the optical hub unit exceeds connectable number per system. • The optical hub unit connected to connection route which accessing OUT2 or OUT3.	• Set the numbers that can be connect to the optical hub unit as followings. • When connect the optical hub unit to back part of the optical hub, please connect to diverge path from OUT1.

Error code	Error name	Error details and cause	Corrective action
1CBFH	The optical hub unit communication error	Communication with the optical hub unit is error.	• Check if there exist any error in SSCNETⅢ cable. • Check if there exist any problem in power supply. • Replace the optical hub unit.
1FF0H	Add-on function minor error	Minor error has been occurred in add-on function.	Check the detail information and refer to technology manual of add-on library that supported file name.

Minor error (SFC) (3100H to 3BFFH)

Minor error (SFC) details and causes, and corrective action are shown below.

Error code	Error name	Error details and cause	Corrective action
31F0H	No specified program (Kn)	Servo program (Kn) specified in motion control step does not exist.	Create the specified servo program.
31F1H	No specified program (Fn/FSn)	The program (Fn/FSn) specified in the operation control step does not exist.	Create the specified operation control program.
31F2H	No specified program (Gn)	The program (Gn) specified in the transition does not exist.	Create the specified transition program.
31F3H	Invalid device specification (Fn/FSn/Gn)	The invalid device is set in the operation control step/transition.	The Motion SFC program code is corrupted. Turn "[Rq.1120] PLC ready flag" OFF and write the Motion SFC program again.
31F4H	Operation/conditional expression unset	No conditional expression is set to the program (Gn) specified in the transition.	Be sure to set the conditional expression in the last block of transition program.
31F5H	Fn/FSn program code Error	Internal code error for the operation control program (Fn/FSn).	The Motion SFC program code is corrupted. Turn "[Rq.1120] PLC ready flag" OFF and write the Motion SFC program again.
31F6H	Gn program code error	Internal code error in the transition program (Gn).	The Motion SFC program code is corrupted. Turn "[Rq.1120] PLC ready flag" OFF and write the Motion SFC program again.
31F7H	WAITON/WAITOFF setting device	The device number of the device set in WAITON/WAITOFF transition is outside the range.	Correct the program so that the device number is within the range.
31F8H	Repeat control limit count over	The repeated control instructions (FOR) exceed the repeated control limit count set in the parameter and are repeatedly executed in one operation control program or transition program.	Review the program so that the repeated control instruction (FOR) does not exceed the repeated control limit count.
31F9H	Program control execution error	An operation error (indirectly specified device read error/assignment execution error) occurred when the block is executed to the program control instruction (IF/CASE/FOR/NEXT).	• Correct the program so that the device No. which indirectly specifies is proper. • Correct the program so that the substitute (S) data is within the range of the data type of (D).
32F0H	PLC ready OFF	"[Rq.1120] PLC ready flag" or "PCPU ready flag" is OFF when starting by D(P).SFCS/M(P).SFCS instruction.	Insert "[Rq.1120] PLC ready flag" and "PCPU ready flag" being ON into the starting interlock condition.
32F1H	Motion SFC program No. error	SFC program No. is specified outside the range of 0 to 255 when starting by D(P).SFCS/M(P).SFCS instruction.	Check the Motion SFC program No. and correct it to a correct sequence program.
32F2H	No Motion SFC program	The specified Motion SFC program does not exist when starting the Motion SFC program by D(P).SFCS/M(P).SFCS instruction.	Check the Motion SFC program No. and correct it to a correct sequence program. Or create the non-created Motion SFC program.
32F3H	Double start error	Start the same Motion SFC program when starting the Motion SFC program by D(P).SFCS/M(P).SFCS instruction.	The double start management is executed in the user side. Insert the user starting signal into the PLC program as the starting interlock.
32F4H	PLC ready OFF	D(P).GINT/M(P).GINT instruction is executed when "[Rq.1120] PLC ready flag" or "PCPU ready flag" is OFF.	Insert the interlock condition of D(P).GINT/M(P).GINT instruction execution when "[Rq.1120] PLC ready flag" and "PCPU ready flag" is ON.
32F5H	No Motion SFC program	The specified motion SFC program does not exist when starting the motion SFC program according to the automatic start setting or GSUB.	Check the Motion SFC program No. and correct it to a correct program. Or create the non-created Motion SFC program."
32F6H	Double start error	The same motion SFC program has already been started when starting the motion SFC program according to the automatic start setting or GSUB.	The double start management is executed in the user side. Insert the user starting signal into the transition condition as the starting interlock condition.
32F7H	Writing during RUN	The motion SFC program to be overwritten during online change is started.	Start after online change is finished.
33F0H	Motion SFC program error	Though not in branch-coupling, the label code/jump code in the selective branch-coupling or the label code/jump code in the parallel branch-coupling exists.	The Motion SFC program code is corrupted. Turn "[Rq.1120] PLC ready flag" OFF and write the Motion SFC program again.
33F1H	Motion SFC program error	The start selective branching destinations are other than all SFT or WAIT transition.	The Motion SFC program code is corrupted. Turn "[Rq.1120] PLC ready flag"" OFF and write the Motion SFC program again.
33F2H	Motion SFC program error	WAITON/WAITOFF is not followed by a motion control step. (However, this is permitted to a pointer (Pn) or jump (Pn).)	The Motion SFC program code is corrupted. Turn "[Rq.1120] PLC ready flag" OFF and write the Motion SFC program again.

Error code	Error name	Error details and cause	Corrective action
33F3H	Motion SFC program error	Parallel branching resulted in an END step without parallel coupling.	The Motion SFC program code is corrupted. Turn "[Rq.1120] PLC ready flag" OFF and write the Motion SFC program again.
33F4H	Motion SFC code error	An impossible code is used. The internal code is corrupted.	The Motion SFC program code is corrupted. Turn "[Rq.1120] PLC ready flag" OFF and write the Motion SFC program again.
33F5H	Jump code error 1	Internal code in jump destination information List code) fault.	The Motion SFC program code is corrupted. Turn "[Rq.1120] PLC ready flag" OFF and write the Motion SFC program again.
33F6H	Jump code error 2	Internal code in jump destination information (Label information) fault.	The Motion SFC program code is corrupted. Turn "[Rq.1120] PLC ready flag" OFF and write the Motion SFC program again.
33F7H	Jump code error 3	Internal code in jump destination information (Label number) fault.	The Motion SFC program code is corrupted Turn "[Rq.1120] PLC ready flag" OFF and write the Motion SFC program again.
33F8H	Jump code error 4	Internal code in jump destination information (Label address) fault.	The Motion SFC program code is corrupted. Turn "[Rq.1120] PLC ready flag" OFF and write the Motion SFC program again.
33F9H	Jump code destination Error	The specified pointer does not exist at the jump destination.	The Motion SFC program code is corrupted. Turn "[Rq.1120] PLC ready flag" OFF and write the Motion SFC program again.
33FAH	GSUB setting error 1	The self program was called/started by GSUB.	GSUB cannot call its own program. Correct the Motion SFC program.
33FBH	GSUB setting error 2	The main program was called/started by GSUB.	GSUB cannot call its main program. Correct the Motion SFC program.
33FCH	Parallel branching nesting over	Nesting of parallel branching exceeded 4 levels in the parallel branching route.	The maximum nesting of parallel branching is 4 levels. Check the program to subroutine the branch destination processing.
33FDH	Execution task error	An attempt was made to execute a motion control step K with an event or NMI task.	Motion control steps cannot be executed in the Motion SFC programs executed by the event and NMI tasks.
33FEH	Simultaneously active step count over	The number of simultaneously active steps exceeded 256 when executing.	The maximum number of simultaneously active step count is 256. Correct the motion SFC program.
38E0H	Argument range error	• Any of the value specified in the instruction is outside the range. • For the value specified in the instruction and indirect setting device No. is outside the range, or the device No. of 32-bit type and 64-bit type is odd."	• Check the parameter value and correct the program so that the device No. is within the range. • Correct the program so that the device No. which indirectly specifies is proper.
38E1H	Double open error	MVOPEN instruction was executed to the logged on vision system.	Review the conditions to execute the MVOPEN instruction and correct the program.
38E2H	Unopened error	The instruction is executed to the vision system which is not logged on.	Correct the program to execute the instruction after confirming whether the logon by the MVOPEN instruction has been completed normally or not.
38E3H	Open error	The communication line with the vision system cannot be opened.	• Check the connection of the Ethernet cable. • Correct the IP address and the port No. of the Ethernet communication line setting to the same setting as the connection target vision system.
38E4H	Logon error	The user name or password for logging on the vision system is in error.	Correct the user name and the password of the Ethernet communication line setting to the same setting as the connection target vision system.
38E5H	Communication error	• The communication with the vision system is disconnected. • Communication with MVCLOSE instruction was shut down during instruction execution. • TCP/IP port cannot be open.	• Check the connection of the Ethernet cable. • Correct the program to execute the MVCLOSE instruction after the instruction is completed. • Correct the TCP/IP port No. of the Ethernet communication line setting to the same setting as the connection target vision system. When not using the TCP/IP protocol, delete the TCP/IP port No.
38E6H	No vision program	The specified vision program (job) does not exist in the vision system.	For the vision program name of the vision program operation setting, specify the job name existing in the vision system.
38E7H	Read value error	The data of read value cell is not an integer value.	Check that the cell/tag contents specified in the read value cell of the vision program operation setting are integer. To read the floating-point type data, correct the program to use the TCP/IP protocol or the MVIN instruction.

Error code	Error name	Error details and cause	Corrective action
38E8H	Execute time-out	Execution of the vision system dedicated function does not finish within the specified time.	Review the time-out period specified by the vision system dedicated function and correct the program.
38E9H	Trigger response time-out	The response to the image pickup is not returned within the specified time.	• Review the time-out period specified by the vision system dedicated function and correct the program. • Check if there is an execution error of job in the vision system side by In-Sight® Explorer and correct the job.
38EAH	Offline error	The vision system is in the "Offline" status.	Set the vision system in "Online" status by In-Sight® Explorer.
38EBH	Control authority error	User authorities to control the vision system are not enough.	For the user name which can be specified by the Ethernet communication line setting, specify the user whose access level is "Full access" or "Protect" in the user list setting of In-Sight® Explorer. Also, for "Protect", "Online/Offline switching available" needs to be valid.
38ECH	Vision system number error	The Ethernet communication line setting corresponding to the specified vision system number is not set.	Correct the program to use the vision system number which has the Ethernet communication line setting.
38EDH	Double start error	The vision system dedicated function is already being executed for the same vision system.	Correct the program to execute the following vision system dedicated function after confirming the status storage device of the vision system not in "In execution".
38EEH	Vision program load incomplete error	Trigger is issued before the vision program is loaded.	Correct the program to issue a trigger after confirming the status storage device of the vision program has become "1".
38EFH	Native mode command send error	Send command string specified length in (S2) of the MVCOM instruction is outside the range of 1 to 191 bytes.	Correct the program so that the send command string length specified by (S2) is 1 to 191 bytes.
38F0H	Native command receive error	The data length received by the MVCOM instruction exceeds 256 bytes. Or the storage device space specified in (D) is insufficient.	• Do not use the native mode command where the data length of the result exceeds 256 bytes. • When the data length of the result is within 256 bytes, correct the device No. of (D).
38F1H	Cell/tag name error	• The string length of cell/tag name specified in (S2) of the MVIN/MVOUT instruction is outside the range of 1 to 32 bytes. • The cell/tag specified in (S2) of the MVIN/MVOUT instruction does not exist. • The data type of the cell/tag specified in (S2) of the MVOUT instruction and the transfer data type/range specified in (S3) do not match.	• Correct the program so that the length of cell/tag name specified by (S2) is 1 to 32 bytes. • Confirm that the cell/tag specified by (S2) is defined in vision system side. • Correct the program so that the (S3) data type and the data range are corresponding to the vision system side in MVOUT instruction.
38F2H	Received data conversion error	• Data received by the MVIN instruction cannot be recognized as numeric data. • At the BIN conversion mode of the MVCOM instruction, received data cannot be recognized as numeric data.	Correct the program to specify "0: ASCII" to (S3) of the MVCOM instruction or use the MC protocol when acquiring the data (string etc.) other than numerical value from the vision system.
38F3H	Transfer data error	The transferred data specified by the MVOUT instruction (S3) is incorrect.	When the floating point type is specified in the data of (S3), correct the program so that the data is within the range of the 32-bit floating point type.
3901H	EI execution error	Event task enable was executed at except for the normal task.	Event task enable may be executed in the normal task only. Correct the program.
3902H	DI execution error	Event task disable was executed except for the normal task.	Event task disable may be executed in the normal task only. Correct the program.
3903H	BMOV execution error	• (S) to (S)+(n-1) is outside the device range. • (S) is a bit device and its device number is not a multiple of 16. • (D) to (D)+(n-1) is outside the device range. • (D) is a bit device and its device number is not a multiple of 16. • (n) is outside the range of 0 to 1000000000. • The combination of (S) and (D) is not correct.	• Change (S) or (n) so that the block transfer range is within the device range. • When (S) is a bit device, correct the program so that the device number to be multiple of 16. • Change (D) or (n) so that the block transfer range is within the device range. • When (D) is a bit device, correct the program so that the device number to be multiple of 16. • Correct the program so that (n) is within the range of 0 to 1000000000. • Correct the program so that the combination of (S) and (D) is correct.
3904H	TIME execution error	The data of (S) is outside the range of 0 to 2147483647.	Correct the program so that the data of (S) is within the range of 0 to 2147483647.

Error code	Error name	Error details and cause	Corrective action
3905H	FMOV execution error	• (D) to (D)+(n-1) is outside the range of the device. • (n) is outside the range of 0 to 1000000000. • (D) is the CPU buffer memory other than self CPU or the module access device of the module other than self CPU management.	• Change (D) or (n) so that the block transfer range is within the device range. • Correct the program so that (n) is within the range of 0 to 1000000000. • Correct the program so that (D) is the CPU buffer memory of self CPU or the module access device of the module of self CPU management.
3908H	CHGV execution error	The specified axis number of (S1) is outside the range.	Correct the specified axis number of (S1) to be within the range.
390AH	CHGP execution error	• The specified axis number of (S1) is outside the range. • (S2) is outside the range of 0 to 1. • The device number of (S3) is an odd number. • (S3) to ((S3)+7) is outside the range of device.	• Correct the specified axis number of (S1) to be within the range. • Correct the program so that the (S2) is within the range of 0 to 1. • Correct the program so that the (S3) is an even number device. • Correct the program so that (S3) to ((S3)+7) is within the range of device.
390BH	CHGT execution error	The specified axis number of (S1) is outside the range.	Correct the specified axis number of (S1) to be within the range.
390CH	CHGVS execution error	The specified axis number of (S1) is outside the range.	Correct the specified axis number of (S1) to be within the range.
3910H	Assign (=) execution error	• The (S) data is outside the range of the data type of (D). • The device number which indirectly specifies (D) is illegal."	• Correct the program so that the data of (S) is within the range of the data (D) type. • Correct the program so that to the device number which indirectly specifies (D) is proper.
3911H	Addition (+) execution error	Internal processing error occurred when addition (+) is executing.	The Motion SFC program code is corrupted. Turn "[Rq.1120] PLC ready flag" OFF and write the Motion SFC program again.
3912H	Subtraction (-) execution error	Internal processing error occurred when subtraction (-) is executing.	The Motion SFC program code is corrupted. Turn "[Rq.1120] PLC ready flag" OFF and write the Motion SFC program again.
3913H	Multiplication (*) execution error	Internal processing error occurred when multiplication (*) is executing.	The Motion SFC program code is corrupted. Turn "[Rq.1120] PLC ready flag" OFF and write the Motion SFC program again.
3914H	Division (/) execution error	The divisor is 0.	Correct the program so that the divisor is not 0.
3915H	Remainder (%) execution error	The divisor is 0.	Correct the program so that the divisor is not 0.
3917H	MVOUT execution error	Internal processing error occurred when MVOUT is executing.	The Motion SFC program code is corrupted. Turn "[Rq.1120] PLC ready flag" OFF and write the Motion SFC program again.
3918H	MVOPEN execution error	Internal processing error occurred when MVOPEN is executing.	The Motion SFC program code is corrupted. Turn "[Rq.1120] PLC ready flag" OFF and write the Motion SFC program again.
3919H	MVPST execution error	Internal processing error occurred when MVPST is executing.	The Motion SFC program code is corrupted. Turn "[Rq.1120] PLC ready flag" OFF and write the Motion SFC program again.
391AH	MVLOAD execution error	Internal processing error occurred when MVLOAD is executing.	The Motion SFC program code is corrupted. Turn "[Rq.1120] PLC ready flag" OFF and write the Motion SFC program again.
391BH	MVTRG execution error	Internal processing error occurred when MVTRG is executing.	The Motion SFC program code is corrupted. Turn "[Rq.1120] PLC ready flag" OFF and write the Motion SFC program again.
391CH	MVIN execution error	Internal processing error occurred when MVIN is executing.	The Motion SFC program code is corrupted. Turn "[Rq.1120] PLC ready flag" OFF and write the Motion SFC program again.
391DH	MVFIN execution error	Internal processing error occurred when MVFIN is executing.	The Motion SFC program code is corrupted. Turn "[Rq.1120] PLC ready flag" OFF and write the Motion SFC program again.
391EH	MVCLOSE execution error	Internal processing error occurred when MVCLOSE is executing.	The Motion SFC program code is corrupted. Turn "[Rq.1120] PLC ready flag" OFF and write the Motion SFC program again.

Error code	Error name	Error details and cause	Corrective action
391FH	MVCOM execution error	Internal processing error occurred when MVCOM is executing.	The Motion SFC program code is corrupted. Turn "[Rq.1120] PLC ready flag" OFF and write the Motion SFC program again.
3920H	SET execution error	The device number which indirectly specifies (D) is illegal.	Correct the program so that the device number which indirectly specifies (D) is proper.
3921H	RST execution error	The device number which indirectly specifies (D) is illegal.	Correct the program so that the device number which indirectly specifies (D) is proper.
3922H	SET= execution error	The device number which indirectly specifies (D) is illegal.	Correct the program so that the device number which indirectly specifies (D) is proper.
3923H	RST= execution error	The device number which indirectly specifies (D) is illegal.	Correct the program so that the device number which indirectly specifies (D) is proper.
3924H	DOUT execution error	The device number which indirectly specifies (D) is illegal.	Correct the program so that the device number which indirectly specifies (D) is proper.
3925H	DIN execution error	The device number which indirectly specifies (D) is illegal.	Correct the program so that the device number which indirectly specifies (D) is proper.
3926H	OUT= execution error	The device number which indirectly specifies (D) is illegal.	Correct the program so that the device number which indirectly specifies (D) is proper.
392EH	FOR (assign) execution error	Internal processing error occurred when FOR (assignment) is executing.	The Motion SFC program code is corrupted. Turn "[Rq.1120] PLC ready flag" OFF and write the Motion SFC program again.
3930H	Bit opposite (complemented) execution error	Internal processing error occurred when bit which is in a value is flipped to its opposite setting (complemented) is executing.	The Motion SFC program code is corrupted. Turn "[Rq.1120] PLC ready flag" OFF and write the Motion SFC program again.
3931H	Bit AND execution error	Internal processing error occurred when bit AND is executing.	The Motion SFC program code is corrupted. Turn "[Rq.1120] PLC ready flag" OFF and write the Motion SFC program again.
3932H	Bit OR execution error	Internal processing error occurred when bit OR is executing.	The Motion SFC program code is corrupted. Turn "[Rq.1120] PLC ready flag" OFF and write the Motion SFC program again.
3933H	Bit XOR execution error	Internal processing error occurred when bit XOR is executing.	The Motion SFC program code is corrupted. Turn "[Rq.1120] PLC ready flag" OFF and write the Motion SFC program again.
3934H	Bit right-shifted execution error	Internal processing error occurred when bit right-shifted is executing.	The Motion SFC program code is corrupted. Turn "[Rq.1120] PLC ready flag" OFF and write the Motion SFC program again.
3935H	Bit left-shifted execution error	• Internal processing error occurred when bit left-shifted is executing.	The Motion SFC program code is corrupted. Turn "[Rq.1120] PLC ready flag" OFF and write the Motion SFC program again.
3940H	NOT/OFF execution error	Internal processing error occurred when NOT/OFF is executing.	The Motion SFC program code is corrupted. Turn "[Rq.1120] PLC ready flag" OFF and write the Motion SFC program again.
3941H	AND execution error	Internal processing error occurred when AND is executing.	The Motion SFC program code is corrupted. Turn "[Rq.1120] PLC ready flag" OFF and write the Motion SFC program again.
3942H	OR execution error	Internal processing error occurred when OR is executing.	The Motion SFC program code is corrupted. Turn "[Rq.1120] PLC ready flag" OFF and write the Motion SFC program again.
3950H	SHORT execution error	The data of (S) is outside the range of signed 16-bit integer value.	Correct the program so that the data of (S) is within the range of signed 16-bit integer value.
3951H	USHORT execution error	The data of (S) is outside the range of unsigned 16-bit integer value.	Correct the program so that the data of (S) is within the range of unsigned 16-bit integer value.
3952H	LONG execution error	The data of (S) is outside the range of signed 32-bit integer value.	Correct the program so that the data of (S) is within the range of signed 32-bit integer value.
3953H	ULONG execution error	The data of (S) is outside the range of unsigned 32-bit integer value.	Correct the program so that the data of (S) is within the range of unsigned 32-bit integer value.
3954H	FLOAT execution error	Internal processing error occurred when FLOAT is executing.	The Motion SFC program code is corrupted. Turn "[Rq.1120] PLC ready flag" OFF and write the Motion SFC program again.
3955H	UFLOAT execution error	Internal processing error occurred when UFLOAT is executing.	The Motion SFC program code is corrupted. Turn "[Rq.1120] PLC ready flag" OFF and write the Motion SFC program again.

Error code	Error name	Error details and cause	Corrective action
3956H	DFLT execution error	The data of (S) is not in a valid 32-bit floating-point type.	Correct the program so that the data of (S) is valid as the 32-bit floating-point type.
3957H	SFLT execution error	• The data of (S) is not in a valid 64-bit floating-point type. • The converted value exceeded the range of 32-bit floating-point type.	• Correct the program so that the data of (S) is valid as the 64-bit floating-point type. • Correct the program so that the value is within the range of the 32-bit floating-point type.
3962H	TAN execution error	(S) is 90+(180*n). (n is an integer)	Correct the program so that (S) is outside the range of 90+(180*n).
3963H	ASIN execution error	(S) is outside the range of -1.0 to 1.0.	Correct the program so that (S) is within the range of -1.0 to 1.0.
3964H	ACOS execution error	(S) is outside the range of -1.0 to 1.0.	Correct the program so that (S) is within the range of -1.0 to 1.0.
3966H	SQRT execution error	(S) is a negative number.	Correct the program so that (S) is 0 or a positive number.
3967H	BIN execution error	Any digit of (S) has a value other than 0 to 9.	Correct the program so that any digit of (S) is in 0 to 9.
3968H	BCD execution error	The (S) value is outside the range of BCD data conversion.	Correct the program so that the (S) value is within the range of BCD data conversion.
3969H	LN execution error	(S) is 0 or a negative number.	Correct the program so that (S) is a positive number.
396BH	ABS execution error	The (S) value is outside the range of the absolute value conversion.	Correct the program so that the (S) value is within the range of absolute value conversion.
3970H	SCL execution error	• (S1) is outside the range of 0 to 3. • The (S3) device number is an odd number. • (S3) to (S3)+(2N+1) is outside the range of device. • Point number is outside the range of 2 to 4000. • In the sequential search ((S1) is 0 or 1), the points corresponding to the input values (for positive conversion: X0 to XN-1/for inverse conversion: Y0 to YN-1) are not in ascending order. • Conversion result is outside the range of (D) data type.	• Correct the program so that the (S1) is within the range of 0 to 3. • Correct the program so that (S3) is an even number device. • Correct the program so that (S3) to (S3)+(2N+1) into the range of device. • Correct the program so that the point number is within the range of 2 to 4000. • Correct the program so that the points corresponding to the input values (for positive conversion: X0 to XN-1/for inverse conversion: Y0 to YN-1) is monotone increasing. • Correct the program so that the conversion result is within the range of (D) data type.
3971H	DSCL execution error	• (S1) is outside the range of 0 to 3. • The device numbers of (S2), (S3), (D) are odd numbers. • (S3) to (S3)+(4N+1) is outside the range of device. • Point number is outside the range of 2 to 2000. • In the sequential search ((S1) is 0 or 1), the points corresponding to the input values (for positive conversion: X0 to XN-1/for inverse conversion: Y0 to YN-1) are not in ascending order. • Conversion result is outside the range of (D) data type.	• Correct the program so that (S1) is within the range of 0 to 3. • Correct the program so that (S2), (S3), (D) are the even number devices. • Correct the program so that (S3) to (S3)+(4N+1) is within the range of device. • Correct the program so that the point number is within the range of 2 to 2000. • Correct the program so that the points corresponding to the input values (for positive conversion: X0 to XN-1/for inverse conversion: Y0 to YN-1) is monotone increasing. • Correct the program so that the conversion result is within the range of (D) data type.
3972H	CAMRD execution error	Error occurred when CAMRD is executing.	Confirm and dedicate the error contents in the detail code. (For the detail code, refer to MELSEC iQ-R Motion Controller Programming Manual (Program Design).)
3973H	CAMWR execution error	Error occurred when CAMWR is executing.	Confirm and dedicate the error contents in the detail code. (For the detail code, refer to MELSEC iQ-R Motion Controller Programming Manual (Program Design).)
3975H	CAMMK execution error	Error occurred when CAMMK is executing.	Confirm and dedicate the error contents in the detail code. (For the detail code, refer to MELSEC iQ-R Motion Controller Programming Manual (Program Design).)
3976H	CAMPSCL execution error	Error occurred when CAMPSCL is executing.	Confirm and dedicate the error contents in the detail code. (For the detail code, refer to MELSEC iQ-R Motion Controller Programming Manual (Program Design).)

Error code	Error name	Error details and cause	Corrective action
397AH	TO execution error	• The number of words (n) to be written is outside the range. • Unable to communicate with the target module when executing the instruction, or errors are detected. • Correct the program so that the address specified in (D2) is within the buffer memory range. • Start device number (S) which stores the writing data + number of words (n) to be written is outside the device range. • (S) is a bit device and its device number is not a multiple of 16. • The combination of (S) and (D1) is not correct.	• Correct the program so that number of words (n) to be written is within the range. • Replace if there is an error in the target module. • Correct the program so that the address specified in (D2) is within the buffer memory range. • Correct the program so that start device number (S) which stores the writing data + number of words (n) to be written is within the device range. • When (S) is specified a bit device, specify a multiple of 16 for the device number. • Correct the program so that the (S) and (D1) are combined properly.
397BH	FROM execution error	• The number of words (n) to be read is outside the range. • Unable to communicate with the target module when executing the instruction, or errors are detected. • The address specified in (S2) is outside the buffer memory range. • Start device number (D) which stores the reading data + number of words (n) to be read is outside the device range. • (D) is a bit device and its device number is not a multiple of 16. • The combination of (S1) and (D) is not correct.	• Correct the program so that number of words (n) to be read is within the range. • Replace if there is an error in the target module. • Correct the program so that the address specified in (S2) is within the buffer memory range. • Correct the program so that start device number (D) which stores the reading data + number of words (n) to be read is within the device range. • When (D) is specified a bit device, specify a multiple of 16 for the device number. • Correct the program so that the (S1) and (D) are combined properly.
397CH	RTO execution error	• The number of words (n) to be written is outside the range of 1 to 32767. • The target SSCNETⅢ/H head module axis No. specified by (D1) is outside the range of 601 to 608. • The target SSCNETⅢ/H head module is not connected during the instruction execution. • Start device number (S) which stores the writing data + number of words (n) to be written is outside the device range. • (S) is a bit device and its device number is not a multiple of 16. • RTO instruction was executed again before RTO instruction is executed and complete bit device is turned on.	• Correct the program so that number of words (n) to be written is within the range 1 to 32767. • Correct the program so that the target SSCNETⅢ/H head module axis No. specified by (D1) is within the range of 601 to 608. • Connect the target SSCNETⅢ/H head module. • Correct the program so that start device number (S) which stores the writing data + number of words (n) to be written is within the device range. • When (S) is specified a bit device, specify a multiple of 16 for the device number. • Execute RTO instruction again after the complete bit of RTO instruction is turned on.
397DH	RFROM execution error	• The number of words (n) to be read is outside the range of 1 to 32767. • The target SSCNETⅢ/H head module axis No. specified by (S1) is outside the range of 601 to 608. • The target SSCNETⅢ/H head module is not connected during the instruction execution. • Start device number (D) which stores the reading data + number of words (n) to be read is outside the device range. • (D) is a bit device and its device number is not a multiple of 16. • RFROM instruction was executed again before RFROM instruction is executed and complete bit device is turned on.	• Correct the program so that number of words (n) to be read is within the range 1 to 32767. • Correct the program so that the target SSCNETⅢ/H head module axis No. specified by (S1) is within the range of 601 to 608. • Connect the target SSCNETⅢ/H head module. • Correct the program so that start device number (D) which stores the reading data + number of words (n) to be read is within the device range. • When (D) is specified a bit device, specify a multiple of 16 for the device number. • Execute RFROM instruction again after the complete bit of RFROM instruction is turned on.
3980H	Match (==) execution error	Internal processing error occurred when match (==) is executing.	The Motion SFC program code is corrupted. Turn "[Rq.1120] PLC ready flag" OFF and write the Motion SFC program again.
3981H	Unmatch (!=) execution error	Internal processing error occurred when unmatch (!=) is executing.	The Motion SFC program code is corrupted. Turn "[Rq.1120] PLC ready flag" OFF and write the Motion SFC program again.
3982H	Less than (<) execution error	Internal processing error occurred when "less than" (<) is executing.	The Motion SFC program code is corrupted. Turn "[Rq.1120] PLC ready flag" OFF and write the Motion SFC program again.
3983H	Below (<=) execution error	Internal processing error occurred when following (<=) is executing.	The Motion SFC program code is corrupted. Turn "[Rq.1120] PLC ready flag" OFF and write the Motion SFC program again.
3984H	Above (>) execution error	Internal processing error when exceeding (>) is executing.	The Motion SFC program code is corrupted. Turn "[Rq.1120] PLC ready flag" OFF and write the Motion SFC program again.

Error code	Error name	Error details and cause	Corrective action
3985H	Above (>=) execution error	Internal processing error occurred when (<=) over is executing.	The Motion SFC program code is corrupted. Turn "[Rq.1120] PLC ready flag" OFF and write the Motion SFC program again.
3A00H	SDn read error	The directly specified device No. is outside the range.	• Correct the program so that the device No. which directly specifies is proper. • Set the device range according to the device number/ latch setting of relation setting of CPU parameter within the valid range.
3A01H	SDnL read error	The directly specified device No. is outside the range.	• Correct the program so that the device No. which directly specifies is proper. • Set the device range according to the device number/ latch setting of relation setting of CPU parameter within the valid range.
3A02H	SDnF read error	The directly specified device No. is outside the range.	• Correct the program so that the device No. which directly specifies is proper. • Set the device range according to the device number/ latch setting of relation setting of CPU parameter within the valid range.
3A03H	Dn read error	The directly specified device No. is outside the range.	• Correct the program so that the device No. which directly specifies is proper. • Set the device range according to the device number/ latch setting of relation setting of CPU parameter within the valid range.
3A04H	DnL read error	The directly specified device No. is outside the range.	• Correct the program so that the device No. which directly specifies is proper. • Set the device range according to the device number/ latch setting of relation setting of CPU parameter within the valid range.
3A05H	DnF read error	The directly specified device No. is outside the range.	• Correct the program so that the device No. which directly specifies is proper. • Set the device range according to the device number/ latch setting of relation setting of CPU parameter within the valid range.
3A06H	Wn read error	The directly specified device No. is outside the range.	• Correct the program so that the device No. which directly specifies is proper. • Set the device range according to the device number/ latch setting of relation setting of CPU parameter within the valid range.
3A07H	WnL read error	The directly specified device No. is outside the range.	• Correct the program so that the device No. which directly specifies is proper. • Set the device range according to the device number/ latch setting of relation setting of CPU parameter within the valid range.
3A08H	Wn:F read error	The directly specified device No. is outside the range.	• Correct the program so that the device No. which directly specifies is proper. • Set the device range according to the device number/ latch setting of relation setting of CPU parameter within the valid range.
3A09H	#n read error	The directly specified device No. is outside the range.	• Correct the program so that the device No. which directly specifies is proper. • Set the device range according to the device number/ latch setting of relation setting of CPU parameter within the valid range.
3A0AH	#nL read error	The directly specified device No. is outside the range.	• Correct the program so that the device No. which directly specifies is proper. • Set the device range according to the device number/ latch setting of relation setting of CPU parameter within the valid range.
3A0BH	#nF read error	The directly specified device No. is outside the range.	• Correct the program so that the device No. which directly specifies is proper. • Set the device range according to the device number/ latch setting of relation setting of CPU parameter within the valid range.
3A0CH	U□\Gn read error	The directly specified device No. is outside the range.	Correct the program so that the device No. which directly specifies is proper.

Error code	Error name	Error details and cause	Corrective action
3A0DH	U□\GnL read error	The directly specified device No. is outside the range.	Correct the program so that the device No. which directly specifies is proper.
3A0EH	U□\GnF read error	The directly specified device No. is outside the range.	Correct the program so that the device No. which directly specifies is proper.
3A0FH	U□\HGn read error	The directly specified device No. is outside the range.	Correct the program so that the device No. which directly specifies is proper.
3A10H	U□\HGnL read error	The directly specified device No. is outside the range.	Correct the program so that the device No. which directly specifies is proper.
3A11H	U□\HGnF read error	The directly specified device No. is outside the range.	Correct the program so that the device No. which directly specifies is proper.
3A1BH	SD(n) read error	The indirectly specified device No. is outside the range.	Correct the program so that the device No. which indirectly specifies is proper.
3A1CH	SD(n)L read error	The indirectly specified device No. is outside the range or an odd number.	Correct the program so that the device No. which indirectly specifies is proper.
3A1DH	SD(n)F read error	The indirectly specified device No. is outside the range or an odd number.	Correct the program so that the device No. which indirectly specifies is proper.
3A1EH	D(n) read error	The indirectly specified device No. is outside the range.	• Correct the program so that the device No. which indirectly specifies is proper. • Set the device range according to the device number/ latch setting of relation setting of CPU parameter within the valid range.
3A1FH	D(n)L read error	The indirectly specified device No. is outside the range or an odd number.	• Correct the program so that the device No. which indirectly specifies is proper. • Set the device range according to the device number/ latch setting of relation setting of CPU parameter within the valid range.
3A20H	D(n)F read error	The indirectly specified device No. is outside the range or an odd number.	• Correct the program so that the device No. which indirectly specifies is proper. • Set the device range according to the device number/ latch setting of relation setting of CPU parameter within the valid range.
3A21H	W(n) read error	The indirectly specified device No. is outside the range.	• Correct the program so that the device No. which indirectly specifies is proper. • Set the device range according to the device number/ latch setting of relation setting of CPU parameter within the valid range.
3A22H	W(n)L read error	The indirectly specified device No. is outside the range or an odd number.	• Correct the program so that the device No. which indirectly specifies is proper. • Set the device range according to the device number/ latch setting of relation setting of CPU parameter within the valid range.
3A23H	W(n):F read error	The indirectly specified device No. is outside the range or an odd number.	• Correct the program so that the device No. which indirectly specifies is proper. • Set the device range according to the device number/ latch setting of relation setting of CPU parameter within the valid range.
3A24H	#(n) read error	The indirectly specified device No. is outside the range.	• Correct the program so that the device No. which indirectly specifies is proper. • Set the device range according to the device number/ latch setting of relation setting of CPU parameter within the valid range.
3A25H	#(n)L read error	The indirectly specified device No. is outside the range or an odd number.	• Correct the program so that the device No. which indirectly specifies is proper. • Set the device range according to the device number/ latch setting of relation setting of CPU parameter within the valid range.
3A26H	#(n)F read error	The indirectly specified device No. is outside the range or an odd number.	• Correct the program so that the device No. which indirectly specifies is proper. • Set the device range according to the device number/ latch setting of relation setting of CPU parameter within the valid range.

Error code	Error name	Error details and cause	Corrective action
3A40H	SMn read error	The directly specified device No. is outside the range.	• Correct the program so that the device No. which directly specifies is proper. • Set the device range according to the device number/ latch setting of relation setting of CPU parameter within the valid range.
3A41H	Xn read error	The directly specified device No. is outside the range.	• Correct the program so that the device No. which directly specifies is proper. • Set the device range according to the device number/ latch setting of relation setting of CPU parameter within the valid range.
3A42H	Yn read error	The directly specified device No. is outside the range.	• Correct the program so that the device No. which directly specifies is proper. • Set the device range according to the device number/ latch setting of relation setting of CPU parameter within the valid range.
3A43H	Mn read error	The directly specified device No. is outside the range.	• Correct the program so that the device No. which directly specifies is proper. • Set the device range according to the device number/ latch setting of relation setting of CPU parameter within the valid range.
3A44H	Bn read error	The directly specified device No. is outside the range.	• Correct the program so that the device No. which directly specifies is proper. • Set the device range according to the device number/ latch setting of relation setting of CPU parameter within the valid range.
3A45H	Fn read error	The directly specified device No. is outside the range.	• Correct the program so that the device No. which directly specifies is proper. • Set the device range according to the device number/ latch setting of relation setting of CPU parameter within the valid range.
3A46H	SDn.m read error	The directly specified device No. is outside the range.	• Correct the program so that the device No. which directly specifies is proper. • Set the device range according to the device number/ latch setting of relation setting of CPU parameter within the valid range.
3A47H	Dn.m read error	The directly specified device No. is outside the range.	• Correct the program so that the device No. which directly specifies is proper. • Set the device range according to the device number/ latch setting of relation setting of CPU parameter within the valid range.
3A48H	Wn.m read error	The directly specified device No. is outside the range.	• Correct the program so that the device No. which directly specifies is proper. • Set the device range according to the device number/ latch setting of relation setting of CPU parameter within the valid range.
3A49H	#n.m read error	The directly specified device No. is outside the range.	• Correct the program so that the device No. which directly specifies is proper. • Set the device range according to the device number/ latch setting of relation setting of CPU parameter within the valid range.
3A4AH	U□Gn.m read error	The directly specified device No. is outside the range.	• Correct the program so that the device No. which directly specifies is proper.
3A4BH	U□\HGn.m read error	The directly specified device No. is outside the range.	• Correct the program so that the device No. which directly specifies is proper.
3A54H	SM(n) read error	The indirectly specified device No. is outside the range.	• Correct the program so that the device No. which indirectly specifies is proper.
3A55H	X(n) read error	The indirectly specified device No. is outside the range.	• Correct the program so that the device No. which indirectly specifies is proper.
3A56H	Y(n) read error	The indirectly specified device No. is outside the range.	• Correct the program so that the device No. which indirectly specifies is proper.
3A57H	M(n) read error	The indirectly specified device No. is outside the range.	• Correct the program so that the device No. which indirectly specifies is proper. • Set the device range according to the device number/ latch setting of relation setting of CPU parameter within the valid range.

Error code	Error name	Error details and cause	Corrective action
3A58H	B(n) read error	The indirectly specified device No. is outside the range.	• Correct the program so that the device No. which indirectly specifies is proper. • Set the device range according to the device number/latch setting of relation setting of CPU parameter within the valid range.
3A59H	F(n) read error	The indirectly specified device No. is outside the range.	• Correct the program so that the device No. which indirectly specifies is proper. • Set the device range according to the device number/latch setting of relation setting of CPU parameter within the valid range.
3A60H	16-bit batch Xn read error	The directly specified device No. is outside the range.	• Correct the program so that the device No. which directly specifies is proper. • Set the device range according to the device number/latch setting of relation setting of CPU parameter within the valid range.
3A61H	32-bit batch Xn read error	The directly specified device No. is outside the range.	• Correct the program so that the device No. which directly specifies is proper. • Set the device range according to the device number/latch setting of relation setting of CPU parameter within the valid range.
3A62H	16-bit batch Yn read error	The directly specified device No. is outside the range.	• Correct the program so that the device No. which directly specifies is proper. • Set the device range according to the device number/latch setting of relation setting of CPU parameter within the valid range.
3A63H	32-bit batch Yn read error	The directly specified device No. is outside the range.	• Correct the program so that the device No. which directly specifies is proper. • Set the device range according to the device number/latch setting of relation setting of CPU parameter within the valid range.
3A64H	16-bit batch Mn read error	The directly specified device No. is outside the range.	• Correct the program so that the device No. which directly specifies is proper. • Set the device range according to the device number/latch setting of relation setting of CPU parameter within the valid range.
3A65H	32-bit batch Mn read error	The directly specified device No. is outside the range.	• Correct the program so that the device No. which directly specifies is proper. • Set the device range according to the device number/latch setting of relation setting of CPU parameter within the valid range.
3A66H	16-bit batch Bn read error	The directly specified device No. is outside the range.	• Correct the program so that the device No. which directly specifies is proper. • Set the device range according to the device number/latch setting of relation setting of CPU parameter within the valid range.
3A67H	32-bit batch Bn read error	• The directly specified device No. is outside the range.	• Correct the program so that the device No. which directly specifies is proper. • Set the device range according to the device number/latch setting of relation setting of CPU parameter within the valid range.
3A68H	16-bit batch Fn read error	The directly specified device No. is outside the range.	• Correct the program so that the device No. which directly specifies is proper. • Set the device range according to the device number/latch setting of relation setting of CPU parameter within the valid range.
3A69H	32-bit batch Fn read error	The directly specified device No. is outside the range.	• Correct the program so that the device No. which directly specifies is proper. • Set the device range according to the device number/latch setting of relation setting of CPU parameter within the valid range.
3A6AH	16-bit batch SMn read error	The directly specified device No. is outside the range.	• Correct the program so that the device No. which directly specifies is proper. • Set the device range according to the device number/latch setting of relation setting of CPU parameter within the valid range.

Error code	Error name	Error details and cause	Corrective action
3A6BH	32-bit batch SMn read error	The directly specified device No. is outside the range.	• Correct the program so that the device No. which directly specifies is proper. • Set the device range according to the device number/latch setting of relation setting of CPU parameter within the valid range.
3A6CH	16-bit batch X(n) read error	The indirectly specified device No. is outside the range or is not a multiple of 16.	• Correct the program so that the device No. which indirectly specifies is proper. • Set the device range according to the device number/latch setting of relation setting of CPU parameter within the valid range.
3A6DH	32-bit batch X(n) read error	The indirectly specified device No. is outside the range or is not a multiple of 16.	• Correct the program so that the device No. which indirectly specifies is proper. • Set the device range according to the device number/latch setting of relation setting of CPU parameter within the valid range.
3A6EH	16-bit batch Y(n) read error	The indirectly specified device No. is outside the range or is not a multiple of 16.	• Correct the program so that the device No. which indirectly specifies is proper. • Set the device range according to the device number/latch setting of relation setting of CPU parameter within the valid range.
3A6FH	32-bit batch Y(n) read error	The indirectly specified device No. is outside the range or is not a multiple of 16.	• Correct the program so that the device No. which indirectly specifies is proper. • Set the device range according to the device number/latch setting of relation setting of CPU parameter within the valid range.
3A70H	16-bit batch M(n) read error	The indirectly specified device No. is outside the range or is not a multiple of 16.	• Correct the program so that the device No. which indirectly specifies is proper. • Set the device range according to the device number/latch setting of relation setting of CPU parameter within the valid range.
3A71H	32-bit batch M(n) read error	The indirectly specified device No. is outside the range or is not a multiple of 16.	• Correct the program so that the device No. which indirectly specifies is proper. • Set the device range according to the device number/latch setting of relation setting of CPU parameter within the valid range.
3A72H	16-bit batch B(n) read error	The indirectly specified device No. is outside the range or is not a multiple of 16.	• Correct the program so that the device No. which indirectly specifies is proper. • Set the device range according to the device number/latch setting of relation setting of CPU parameter within the valid range.
3A73H	32-bit batch B(n) read error	The indirectly specified device No. is outside the range or is not a multiple of 16.	• Correct the program so that the device No. which indirectly specifies is proper. • Set the device range according to the device number/latch setting of relation setting of CPU parameter within the valid range.
3A74H	16-bit batch F(n) read error	The indirectly specified device No. is outside the range or is not a multiple of 16.	• Correct the program so that the device No. which indirectly specifies is proper. • Set the device range according to the device number/latch setting of relation setting of CPU parameter within the valid range.
3A75H	32-bit batch F(n) read error	The indirectly specified device No. is outside the range or is not a multiple of 16.	• Correct the program so that the device No. which indirectly specifies is proper. • Set the device range according to the device number/latch setting of relation setting of CPU parameter within the valid range.
3A76H	16-bit batch SM(n) read error	The indirectly specified device No. is outside the range or is not a multiple of 16.	• Correct the program so that the device No. which indirectly specifies is proper. • Set the device range according to the device number/latch setting of relation setting of CPU parameter within the valid range.
3A77H	32-bit batch SM(n) read error	The indirectly specified device No. is outside the range or is not a multiple of 16.	• Correct the program so that the device No. which indirectly specifies is proper. • Set the device range according to the device number/latch setting of relation setting of CPU parameter within the valid range.

Error code	Error name	Error details and cause	Corrective action
3A90H	MCFUN Execution Error	• The add-on module specified in (S1) is not registered. • The string specified in (S1) exceeds the range of the characters number. • The device numbers in (S2) and (D1) are odd. • The device numbers which indirectly specifies (S1), (S2), (D1) and (D2) are illegal. • The called add-on module returns to abnormal termination.	• Specify the registered add-on module. • Correct the program so that it will be within the character range. • Correct the program so that (S2), (D1) is an even number device. • Correct the program so that the device No. which indirectly specifies is proper. • Remove the conditions that may cause add-on module error.

Moderate error (2000H to 3BFFH)

Moderate error details and causes, and corrective action are shown below.

Error code	Error name	Error details and cause	Corrective action
2000H	Module configuration error	The module type set in the system parameters (I/O assignment setting) differs from that of the module actually mounted.	Re-set the module type in the system parameters in accordance with the CPU module or intelligent function module actually mounted.
2001H	Module configuration error	The I/O numbers set in the system parameters (I/O assignment setting) are overlapping between modules.	Re-set the I/O numbers in the system parameters in accordance with the intelligent function module or I/O module actually mounted.
2002H	Module configuration error	The number of points assigned to the intelligent function module in the system parameters (I/O assignment setting) is smaller than that of the module actually mounted.	Re-set the number of points in the system parameters in accordance with the intelligent function module actually mounted.
2006H	Module configuration error	A module is mounted on the 65th slot or later.	Remove the module mounted on the 65th slot or later.
2007H	Module configuration error	A module is mounted on the slot whose number is later than that specified in parameter (I/O assignment setting).	Remove the module mounted on the slot whose number is later than that specified in system parameter (I/O assignment setting).
2008H	Module configuration error	A module is mounted over or across the maximum number of I/O points (4096).	• Remove the module mounted over or across the maximum number of I/O points (4096). • Replace the module mounted on the last slot to the one that does not exceed the maximum number of I/O points (4096).
2009H	Module configuration error	There is no response from the I/O module or intelligent function module accessed.	• Check and correct the I/O assignment setting in the system parameters. • The possible cause is a hardware failure of the I/O module or intelligent function module accessed. Please consult your local Mitsubishi representative.
2020H	Module configuration error	An unsupported module is mounted.	Remove the unsupported module. If all the modules are supported, the possible cause is a hardware failure of the CPU module, base unit, or module (I/O module or intelligent function module) connected. Please consult your local Mitsubishi representative.
2021H	Module configuration error	In the multiple CPU system, the control CPU of the Q series intelligent function module incompatible with the multiple CPU system is set to other than CPU No.1.	• Replace the Q series intelligent function module with the one (function version B) compatible with the multiple CPU system. • Set the control CPU of the Q series intelligent function module incompatible with the multiple CPU system to CPU No.1.
2040H	CPU module configuration error	• The number of CPU modules set in the system parameters (I/O assignment setting) differs from the number of CPU modules actually mounted. • The CPU module is mounted on the slot different from the one specified in the system parameters (I/O assignment setting).	• Correctly set the number of CPU modules (including the empty setting) in the system parameters in accordance with the number of CPU modules actually mounted. • Correctly set the system parameters so that the setting and actual CPU module mounting status will be the same.
2041H	CPU module configuration error	• The CPU module is not mounted on the slot that is set for the CPU module in the system parameters (I/O assignment setting). • An I/O module or intelligent function module is mounted between the CPU modules.	• Correctly set the number of CPU modules (including the empty setting) in the system parameters in accordance with the number of CPU modules actually mounted. • Remove the I/O module or intelligent function module mounted between the CPU modules.
2043H	CPU module configuration error	The CPU module is mounted on the inapplicable slot.	• Mount the CPU module on the applicable slot (CPU slot or I/O slot 0 to 6). • Remove the CPU module from the inapplicable slot.
2044H	CPU module configuration error	The host CPU No. set in the system parameters (I/O assignment setting) differs from the one determined by the mounting position of the CPU module.	Re-set the host CPU No. in the system parameters in accordance with the mounting position of the CPU module.
2050H	CPU module configuration error	An unsupported CPU module is mounted.	Remove the unsupported CPU module. If all the CPU modules are supported, the possible cause is a hardware failure of the CPU module or base unit. Please consult your local Mitsubishi representative.
2060H	Base unit configuration error	Eight or more extension base units are connected.	Reduce the number of extension base units to seven or less.

Error code	Error name	Error details and cause	Corrective action
2070H	Base unit configuration error	An unsupported base unit is connected.	Disconnect the unsupported base unit. If all the base units are supported, the possible cause is a hardware failure of the CPU module or base unit. Please consult your local Mitsubishi representative.
2080H	Inter-module synchronization configuration error	An inter-module synchronization signal error has been detected.	The possible cause is a hardware failure of the CPU module, base unit, or module (I/O module or intelligent function module) connected. Please consult your local Mitsubishi representative.
20E0H	Invalid module	A module that the CPU module cannot recognize is mounted.	• Mount only applicable modules. • The possible cause is a hardware failure of the I/O module or intelligent function module accessed. Please consult your local Mitsubishi representative.
2120H	Memory card error	The memory card was removed without the card being disabled.	Disable the memory card, and then remove it.
2121H	Memory card error	An error has been detected in the memory card.	Format the memory card, or re-insert the memory card. If the same error code is displayed again, the possible cause is a hardware failure of the memory card. Replace the memory card.
2122H	Memory card error	The CPU module did not start because the memory card was not restored during the startup processing.	Reset the CPU module. If the same error code is displayed again, the possible cause is a hardware failure of the memory card. Replace the memory card.
2180H	Invalid file	An invalid file has been detected.	Check the detailed information (drive/file information), select the correct file name, and write the specified file to the CPU module. If the same error code is displayed again, the possible cause is a hardware failure of the CPU module. Please consult your local Mitsubishi representative.
21A0H	File specification error	The file which specified control data in boot operation file does not exist in the memory card.	Please check the detailed information (Drive/File information) and write the displayed file. If still shows the same error, maybe the memory card hardware is error. Exchange the memory card.
21A1H	File specification error	The file specified in parameter cannot be created.	Check the detailed information (parameter information), and correct the name and size of the file corresponding to the displayed number.
			Check the detailed information (drive/file information), take the following actions. • Format the corresponding drive. • Delete unnecessary files on the corresponding drive to increase free space. • Unlock the corresponding drive if it is locked.
2200H	Parameter error	The parameter file do not exist.	Check the detailed information, select the correct file name, and write the file to the CPU module.
2220H	Parameter error	The parameter setting is corrupted.	Check the detailed information (parameter information), and write the displayed parameter setting to the CPU module. If the same error code is displayed again, the possible cause is a hardware failure of the data memory in the CPU module, the memory card, or the module (I/O module or intelligent function module) connected. Please consult your local Mitsubishi representative.
2221H	Parameter error	The set value is out of range.	Check the detailed information (parameter information), and correct the parameter setting. If the same error code is displayed again, the possible cause is a hardware failure of the data memory in the CPU module, the memory card, or the module (I/O module or intelligent function module) connected. Please consult your local Mitsubishi representative.
2222H	Parameter error	Use of the function that is not supported by the module is enabled in parameter.	Check the detailed information (parameter information), and correct the parameter setting. If the same error code is displayed again, the possible cause is a hardware failure of the data memory in the CPU module, the memory card, or the module (I/O module or intelligent function module) connected. Please consult your local Mitsubishi representative.

Error code	Error name	Error details and cause	Corrective action
2225H	Parameter error	The CPU module model set to the project using the engineering tool differs from that of the CPU module actually mounted.	Correct the CPU module model set to the project in accordance with the CPU module actually mounted.
2240H	Parameter error (module)	In the multiple CPU system, the I/O module or intelligent function module controlled by another CPU module is specified in the module parameters.	Check the detailed information (parameter information), and correct the parameter setting corresponding to the displayed number. If the same error code is displayed again, the possible cause is a hardware failure of the data memory in the CPU module or the module (I/O module or intelligent function module) connected. Please consult your local Mitsubishi representative.
2241H	Parameter error (module)	• The I/O numbers set in the system parameters differ from those of the module actually mounted. • The target module is not mounted on the slot where the system parameters and module parameters are set. • The module type set in parameter differs from that of the module actually mounted.	• Check if the system configuration displayed on the system monitor window of the engineering tool match the actual system configuration. • Check the detailed information (parameter information), and correct the parameter setting corresponding to the displayed number. If the same error code is displayed again, the possible cause is a hardware failure of the data memory in the CPU module or the module (I/O module or intelligent function module) connected. Please consult your local Mitsubishi representative.
2242H	Parameter error (module)	The intelligent function module has detected a module parameter error.	Check the detailed information (system configuration information), and check the module corresponding to the displayed I/O number. If the same error code is displayed again, the possible cause is a hardware failure of the data memory in the CPU module or the intelligent function module connected. Please consult your local Mitsubishi representative.
2280H	Parameter error (refresh)	The refresh setting is not set correctly.	Check the detailed information (parameter information), and correct the parameter setting corresponding to the displayed number so that the data are refreshed within the specified device range.
2281H	Parameter error (refresh)	A device that cannot be used as a refresh device is specified.	Check the detailed information (parameter information), and correct the parameter setting corresponding to the displayed number.
2282H	Parameter error (refresh)	The number of specified refresh points is invalid.	Check the detailed information (parameter information), and correct the parameter setting corresponding to the displayed number.
22E0H	Parameter verification error	• In the multiple CPU system, the system parameter settings of the host CPU module differ from those of other CPU modules. • In the multiple CPU system, the system parameter settings are overwritten only to the host CPU module, and the settings differ from those of other CPU modules.	• Check the detailed information (parameter information), and correct the system parameter settings corresponding to the displayed number for the CPU No.2 and later. The settings need to be the same between all the CPU modules. (The module synchronization setting and fixed scan communication setting need to be the same between the CPU modules that use these functions.) • When the system parameter settings are changed, update the settings of all the CPU modules connected. (The system parameter settings must be same in all the CPU modules.)
2300H	Security key authentication error	The security key set to the program does not match the one registered to the CPU module.	Check and correct the security key setting.
2301H	Security key authentication error	The security key is set to the program, but it is not registered to the CPU module.	Check and correct the security key setting.
2302H	Security key authentication error	• The security key set to the file is corrupted and does not match the one registered to the CPU module. • The security key registered to the CPU module is corrupted and does not match the one set to the file.	Write the file to the CPU module again. If the same error code is displayed again, the possible cause is a hardware failure of the CPU module. Please consult your local Mitsubishi representative.
2400H	Module verification error	• The I/O module information at power-on differs from the information of modules actually mounted. • The I/O module or intelligent function module is not mounted properly or was removed during operation.	Check the detailed information (system configuration information), and check the module corresponding to the displayed slot number.
2401H	Module verification error	A CPU module, I/O module, or intelligent function module was mounted on the base unit during operation.	• Check the detailed information (system configuration information), and check the module corresponding to the displayed slot number. • Do not mount a CPU module, I/O module, nor intelligent function module during operation.

Error code	Error name	Error details and cause	Corrective action
2440H	Module major error	An error has been detected in the I/O module or intelligent function module during the initial processing.	The possible cause is a hardware failure of the error module. Please consult your local Mitsubishi representative.
2441H	Module major error	An error has been detected in the I/O module or intelligent function module when the instruction was executed.	The possible cause is a hardware failure of the error module. Please consult your local Mitsubishi representative.
2442H	Module major error	An error has been detected in the I/O module or intelligent function module during the END processing.	The possible cause is a hardware failure of the error module. Please consult your local Mitsubishi representative.
2443H	Module major error	An error has been detected in the I/O module or intelligent function module.	The possible cause is a hardware failure of the error module. Please consult your local Mitsubishi representative.
2450H	Module major error	• A major error has been notified from the intelligent function module connected. • The I/O module or intelligent function module is not mounted properly or was removed during operation."	• Check the connection status of the extension cable. • Check the detailed information (system configuration information), and check the module corresponding to the displayed slot number. • Reset the CPU module, and run it again. If the same error code is displayed again, the possible cause is a hardware failure of the error module. Please consult your local Mitsubishi representative.
2460H	Another CPU module major error	An error has been detected in another CPU module during the initial processing.	Reset the CPU module, and run it again. If the same error code is displayed again, the possible cause is a hardware failure of the host CPU module or another CPU module where the error has been detected. Please consult your local Mitsubishi representative.
2463H	Another CPU module major error	An error has been detected in another CPU module.	Reset the CPU module, and run it again. If the same error code is displayed again, the possible cause is a hardware failure of the host CPU module or another CPU module where the error has been detected. Please consult your local Mitsubishi representative.
2470H	Another CPU module major error	A major error has been notified from another CPU module.	Reset the CPU module, and run it again. If the same error code is displayed again, the possible cause is a hardware failure of the host CPU module or another CPU module where the error has been detected. Please consult your local Mitsubishi representative.
2480H	Multiple CPU error	• In the multiple CPU system, an error has been detected in the CPU module where "Stop" is set in the operation mode setting parameter. • Any CPU module other than CPU No.1 is mounted in the inapplicable slot. (An error occurs in the CPU module mounted in the inapplicable slot.)	• Check the detailed information (system configuration information), identify the error CPU module, and eliminate the error cause. • Remove the CPU module from the inapplicable slot.
2481H	Multiple CPU error	In the multiple CPU system, any CPU module other than CPU No.1 was disconnected from the base unit during operation. Or, any CPU module other than CPU No.1 was reset.	Check the mounting status and reset status of the CPU modules other than CPU No.1.
24C0H	System bus error	An error was detected on the system bus.	• Take measures to reduce noise. • Reset the CPU module, and run it again. If the same error code is displayed again, the possible cause is a hardware failure of the CPU module, base unit, extension cable, or module (I/O module or intelligent function module) connected. Please consult your local Mitsubishi representative.
24C1H	System bus error	An error was detected on the system bus.	• Take measures to reduce noise. • Reset the CPU module, and run it again. If the same error code is displayed again, the possible cause is a hardware failure of the CPU module, base unit, extension cable, or module (I/O module or intelligent function module) connected. Please consult your local Mitsubishi representative.

Error code	Error name	Error details and cause	Corrective action
24C2H	System bus error	An error was detected on the system bus.	• Check the connection status of the extension cable. • Take measures to reduce noise. • Reset the CPU module, and run it again. If the same error code is displayed again, the possible cause is a hardware failure of the CPU module, base unit, extension cable, or module (I/O module or intelligent function module) connected. Please consult your local Mitsubishi representative.
24C3H	System bus error	An error was detected on the system bus.	• Take measures to reduce noise. • Reset the CPU module, and run it again. If the same error code is displayed again, the possible cause is a hardware failure of the CPU module, base unit, extension cable, or module (I/O module or intelligent function module) connected. Please consult your local Mitsubishi representative.
24C4H	System bus error	An error was detected on the system bus.	• Take measures to reduce noise. • Reset the CPU module, and run it again. If the same error code is displayed again, the possible cause is a hardware failure of the base unit, extension cable, or module (I/O module or intelligent function module) connected. Please consult your local Mitsubishi representative.
24C5H	System bus error	An error was detected on the system bus.	• Take measures to reduce noise. • Reset the CPU module, and run it again. If the same error code is displayed again, the possible cause is a hardware failure of the base unit, extension cable, or module (I/O module or intelligent function module) connected. Please consult your local Mitsubishi representative.
24C6H	System bus error	An error was detected on the system bus.	• Take measures to reduce noise. • Reset the CPU module, and run it again. If the same error code is displayed again, the possible cause is a hardware failure of the CPU module or extension cable. Please consult your local Mitsubishi representative.
24C8H	System bus error	An error was detected on the system bus.	• Take measures to reduce noise. • Reset the CPU module, and run it again. If the same error code is displayed again, the possible cause is a hardware failure of the extension cable, or module (I/O module or intelligent function module) connected. Please consult your local Mitsubishi representative.
24D0H	System bus error	An error was detected on the system bus.	• Take measures to reduce noise. • Reset the CPU module, and run it again. If the same error code is displayed again, the possible cause is a hardware failure of the CPU module, base unit, or extension cable. Please consult your local Mitsubishi representative.
24E0H	System bus error	An error was detected on the system bus.	• Take measures to reduce noise. • Reset the CPU module, and run it again. If the same error code is displayed again, the possible cause is a hardware failure of the CPU module or base unit. Please consult your local Mitsubishi representative.
2500H	WDT error	A H/W WDT error caused by the main cycle exceeding 1.0 [s] was detected.	Please take measures below. • Change the operation cycle into a large value. • Reduce the number of command execution of the event task or NMI task in the system setting. If the same error code is displayed again, the possible cause is a hardware failure of the CPU module. Please consult your local Mitsubishi representative.
2501H	WDT error	A S/W WDT error caused by an excessively long Motion operating time (5 × the operation cycle setting or more) was detected.	Please take measures below. • Change the operation cycle into a large value. • Reduce the number of command execution of the event task or NMI task in the system setting. If the same error code is displayed again, the possible cause is a hardware failure of the CPU module. Please consult your local Mitsubishi representative.

Error code	Error name	Error details and cause	Corrective action
2520H	Invalid interrupt	Even though an interrupt was requested, there is no interrupt factor.	• Take measures to reduce noise. • Reset the CPU module, and run it again. If the same error code is displayed again, the possible cause is a hardware failure of the CPU module, base unit, or module (I/O module or intelligent function module) connected. Please consult your local Mitsubishi representative.
2522H	Invalid interrupt	An interrupt was requested from the module with no interrupt pointer setting.	• Check and correct the interrupt pointer setting in the module parameters. • Take measures so that no interrupt is requested from the module with no interrupt pointer setting. • Check and correct the interrupt setting in the buffer memory of the intelligent function module.
2600H	Motion operation cycle time over	The Motion CPU fixed-cycle process did not complete within the set Motion operation cycle.	Please take measures below. • Change the operation cycle into a large value. • Reduce the number of command execution of the event task or NMI task in the system setting. If you see the same error again, there or data memory, the CPU module, the risk of hardware failure of the memory card. Please consult your local Mitsubishi representative.
2610H	Inter-module synchronization signal error	An inter-module synchronization error has been detected.	• Take measures to reduce noise. • Reset the CPU module, and run it again. If the same error code is displayed again, the possible cause is a hardware failure of the CPU module, base unit, extension cable, or module (I/O module or intelligent function module) connected. Please consult your local Mitsubishi representative.
2611H	Inter-module synchronization signal error	An inter-module synchronization error has been detected.	• Take measures to reduce noise. • Reset the CPU module, and run it again. If the same error code is displayed again, the possible cause is a hardware failure of the CPU module, base unit, extension cable, or module (I/O module or intelligent function module) connected. Please consult your local Mitsubishi representative.
2622H	Multiple CPU synchronous processing error	The Motion CPU fixed-cycle process did not complete before the fixed-cycle data send section.	Please take measures below. • Change the operation cycle into a large value. • Reduce the number of command execution of the event task or NMI task in the system setting. If you see the same error again, there or data memory, the CPU module, the risk of hardware failure of the memory card. Please consult your local Mitsubishi representative.
2630H	Multiple CPU synchronization signal error	A multiple CPU synchronization error has been detected.	• Take measures to reduce noise. • Reset the CPU module, and run it again. If the same error code is displayed again, the possible cause is a hardware failure of the CPU module or base unit. Please consult your local Mitsubishi representative.
2631H	Multiple CPU synchronization signal error	A multiple CPU synchronization error has been detected.	• Take measures to reduce noise. • Reset the CPU module, and run it again. If the same error code is displayed again, the possible cause is a hardware failure of the CPU module or base unit. Please consult your local Mitsubishi representative.
2800H	I/O number or network number specification error	The specified I/O number in the program or parameter is out of range (other than 000H to FFFH, 3E0H to 3E3H).	Set the I/O number within the valid range.
2801H	I/O number or network number specification error	The I/O number of the module that does not exist was specified in the program or parameter.	Set the input and output number exists the target module.
2803H	I/O number or network number specification error	The I/O number of the module that cannot be specified in the program or parameter was specified.	Set the input and output number of the unit that can be specified in the program or parameter.
2810H	I/O number or network number specification error	The I/O module or intelligent function module specified in the program or parameter cannot execute the instruction.	The possible cause is a hardware failure of the I/O module or intelligent function module specified in the program or parameter. Please consult your local Mitsubishi representative.

Error code	Error name	Error details and cause	Corrective action
2820H	Device, label, or buffer memory specification error	The device or label area used in the program or parameter exceeded the specified range.	Set the label or devices specified in the program or parameter within the usable range.
2823H	Device, label, or buffer memory specification error	• The buffer memory area of the module specified in the program or parameter exceeded the specified range. • The module specified in the program or parameter does not have buffer memory.	• Set the buffer memory within the valid range. • Set the unit has a buffer memory.
3070H	Boot operation file error	Content of boot operation file is strange.	Confirm boot log file (bootlog.txt) and check the boot operation file.
3071H	Boot function read/write protection error	• Detected the file writing in CPU which set standard ROM write disable. • Detected the file reading from CPU which set standard ROM read disable.	Check the file transmission setting during booting Motion CPU common parameter.
3072H	Boot function security error	• Detected the unmatched verification of file password. • Detected the read to SD memory card etc. of security key set files.	Confirm the bootlog file (bootlog.txt) and check password and security key.
3073H	Boot function execution error	Failed to copy, delete a file and create a folder.	• Check the bootlog file (bootlog.txt) and store the specified file in boot operation files. • Delete the unnecessary file of SD memory card in standard ROM. (Check free space.) • Release the write protect of SD memory card.
3080H	Add-on function moderate error	Moderate error occurs in add-on function.	Check the detail information and refer to technology manual of add-on library that supported file name.
308FH	Add-on function load error	Error occurs in add-on function loading.	Check the error content in detailed code and process accordingly. (Refer to the programming manual (common) for detailed code. Or refer to each add-on library technology manual for detailed add-on library.)
30C0H	Label setting error	• Write label/structure setting only to Motion controller after label setting changed. • Write label allocation information only to Motion controller after access setting from label setting external machine changed.	• Write label/structure setting and label allocation information to Motion controller. • Delete label/structure setting if label is no use. • Please initialize the memory which label allocation information has been written and then write label/structure setting to Motion controller.
30D0H	Servo parameter setting error	Axis type and parameter type do not match in servo network setting.	Set the axis type and parameter type of the servo network setting to be the same type.
30D1H	Synchronous encoder axis setting error	• Specified the amplifier which does not support the synchronous encoder via servo amplifier. • Specified the axis No. which is not in servo network setting. • Specified other than the high-speed counter module. • Set the "[Pr.320] Synchronous encoder axis type" which cannot use in master CPU/independent CPU.	• Specify the amplifier which supports the synchronous encoder via servo amplifier. • Specify the axis No. of servo network setting. • Specify the high-speed counter module. • Correct the "[Pr.320] Synchronous encoder axis type".
30D2H	External signal parameter setting error	• The corresponding module does not exist. • The input module is not the synchronous setting among the modules.	• Set the input module. • Set the input module in the synchronous setting among the modules.
30D3H	High-speed input request signal parameter setting error	• The corresponding module does not exist. • The input module is not the synchronous setting among the modules.	• Set the input module. • Set the input module in the synchronous setting among the modules.
30D4H	Manual pulse generator parameter setting error	• Specified other than the high-speed counter module. • The control CPU is not set to self CPU. • The counter type is not set to "Ring Counter". • The counter action mode is not set to "Pulses counter mode". • 0 is not set to the ring counter upper limit value setting and ring counter lower limit value setting.	• Specify the high-speed count module. • Set the control CPU to self CPU. • Set the counter type to "Ring Counter". • Set the counter action mode to "Pulses counter mode". • Set 0 to the ring counter upper limit value setting and ring counter lower limit value setting.
30E0H	Multiple CPU refresh setting error	Total number of the set transmission points exceeds 256.	Set the total number of transmission points less than 256.
30F0H	Servo amplifier unset error	None of the axes has been set in servo network setting.	Set the axis in servo network setting.
30F1H	Axis number overlapping setting error	Axes have overlapped in servo network setting.	Set in servo network setting so that axis does not overlap.
30F2H	Servo amplifier station No. overlapping setting error	Servo amplifier station No. has overlapped in servo network setting.	Set in servo network setting so that servo amplifier station No. does not overlap.

Error code	Error name	Error details and cause	Corrective action
30F3H	Head module axis component axis setting error	• The setting station No. of SSCNETⅢ/H head module is exceeding the maximum station No. by calculation cycle.	• Check the setting station No. or the operation cycle of SSCNETⅢ/H head module.
30F4H	Communication among drivers setting error	Unusable settings that execute communication among drives are specified in motion controller and servo amplifier corresponding to communication among drives.	Check "Master axis No. selection 1 (PD20) at communication slave setting among drivers" and PD21 to PD23 of servo parameter in slave axis.
30F5H	Multiple CPU advanced synchronous control setting error	• Neither fixed scan communication function nor inter-module synchronous function is set. • "Do not Synchronize" is set in inter-module synchronization target selection. • The same operation cycle is not set in master CPU and slave CPU.	• Set fixed scan communication function or inter-module synchronous function. • Set "Synchronize" in inter-module synchronization target selection. • Set the same operation cycle in master CPU and slave CPU.
30F6H	Multiple CPU advanced synchronous control detection error	• Multiple master CPUs are set. • Master CPU is not set. • Rising timing in each CPU is different and cannot detect master CPU/slave CPU.	• Set only one master CPU. • Set master CPU. • Set "Synchronize" in all CPUs for synchronous rising setting in Multiple CPU advanced synchronous control system configuration.
30F7H	Pressure control setting error	• The number of valid pressure control axes exceeds 8. • Pressure control is set valid in degree axis. • Pressure control is set valid in SSCNETⅢ line.	Please check the setting.

Major error (3C00H to 3FFFH)

Major error details and causes, and corrective action are shown below.

Error code	Error name	Error details and cause	Corrective action
3C00H	Hardware failure	A hardware failure has been detected.	• Take measures to reduce noise. • Reset the CPU module, and run it again. If the same error code is displayed again, the possible cause is a hardware failure of the CPU module. Please consult your local Mitsubishi representative.
3C01H	Hardware failure	A hardware failure has been detected.	• Take measures to reduce noise. • Reset the CPU module, and run it again. If the same error code is displayed again, the possible cause is a hardware failure of the CPU module. Please consult your local Mitsubishi representative.
3C02H	Hardware failure	A hardware failure has been detected.	• Take measures to reduce noise. • Reset the CPU module, and run it again. If the same error code is displayed again, the possible cause is a hardware failure of the CPU module. Please consult your local Mitsubishi representative.
3C03H	Hardware failure	A hardware failure has been detected.	• Take measures to reduce noise. • Reset the CPU module, and run it again. If the same error code is displayed again, the possible cause is a hardware failure of the CPU module. Please consult your local Mitsubishi representative.
3C0FH	Hardware failure	A hardware failure has been detected.	• Take measures to reduce noise. • Reset the CPU module, and run it again. If the same error code is displayed again, the possible cause is a hardware failure of the CPU module. Please consult your local Mitsubishi representative.
3C10H	Hardware failure	A hardware failure has been detected.	• Take measures to reduce noise. • Reset the CPU module, and run it again. If the same error code is displayed again, the possible cause is a hardware failure of the CPU module. Please consult your local Mitsubishi representative.
3C11H	Hardware failure	A hardware failure has been detected.	• Take measures to reduce noise. • Reset the CPU module, and run it again. If the same error code is displayed again, the possible cause is a hardware failure of the CPU module. Please consult your local Mitsubishi representative.
3C12H	Hardware failure	• The waveform of the voltage out of the specified range has been detected in the power supply module. • A hardware failure has been detected in the power supply module, CPU module, base unit, or extension cable.	• Check the waveform of the voltage applied to the power supply module. • Reset the CPU module, and run it again. If the same error code is displayed again, the possible cause is a hardware failure of the power supply module, CPU module, base unit, or extension cable. Please consult your local Mitsubishi representative.
3C20H	Memory error	An error has been detected in the memory.	• Take measures to reduce noise. • Reset the CPU module, and run it again. If the same error code is displayed again, the possible cause is a hardware failure of the CPU module. Please consult your local Mitsubishi representative.
3C21H	Memory error	An error has been detected in the memory.	• Take measures to reduce noise. • Reset the CPU module, and run it again. If the same error code is displayed again, the possible cause is a hardware failure of the CPU module. Please consult your local Mitsubishi representative.
3C22H	Memory error	An error has been detected in the memory.	• Take measures to reduce noise. • Reset the CPU module, and run it again. If the same error code is displayed again, the possible cause is a hardware failure of the CPU module. Please consult your local Mitsubishi representative.
3C2FH	Memory error	An error has been detected in the memory.	• Take measures to reduce noise. • Reset the CPU module, and run it again. If the same error code is displayed again, the possible cause is a hardware failure of the CPU module. Please consult your local Mitsubishi representative.

Error code	Error name	Error details and cause	Corrective action
3C30H	Memory error	An error has been detected in the memory.	• Take measures to reduce noise. • Reset the CPU module, and run it again. If the same error code is displayed again, the possible cause is a hardware failure of the CPU module. Please consult your local Mitsubishi representative.
3C31H	Memory error	An error has been detected in the memory.	• Take measures to reduce noise. • Reset the CPU module, and run it again. If the same error code is displayed again, the possible cause is a hardware failure of the CPU module. Please consult your local Mitsubishi representative.
3C32H	Memory error	An error has been detected in the memory.	• Take measures to reduce noise. • Reset the CPU module, and run it again. If the same error code is displayed again, the possible cause is a hardware failure of the CPU module. Please consult your local Mitsubishi representative.

Appendix 2 Event List

Information such as errors detected by the Motion CPU, and operations done for the module, are saved as "event history" in the standard ROM of the Motion CPU, or the SD memory card.
Refer to event history function for details of the event history function. (☞ Page 246 Event History Function)
When an event occurs, its event code and description can be read using MT Developer2.

Guide for reference of event list

The event list contains the following information.

Item	Description
Event code	The ID number of each event
Event type	The type of each event
Event category	The category of each event
Detected event	The description of each detected event
Detailed information 1 to 3	Details of each detected event

Detailed information

The contents of detailed information 1 to 3.

Detailed information	Item	Description
Detailed information 1	Operation initiator information	The following information on the operation initiator. • Connection port (connection information such as Ethernet or USB) • I/O No. • CPU No. (the CPU No. of each CPU module in a Multiple CPU system) • Network No. • Station No. • IP Address
	Event history file information	Information on the event history file.
	Axis control event information	Information on axis control.
	Time information	Information on time.
	Home position return information	Information on home position return.
	SSCNETⅢ(/H) communication information	Information on SSCNETⅢ(/H) communication.
	Parameter change information	Information on parameter.
	Transient command information	Information on transient command.
	Operating system version information	Information on version of operating system software.
Detailed information 2	Communication speed and communication mode	Information on the communication speed and the communication mode.
	Communication status	Information on the communication status.
	Security key operation information	Information on security keys.
	Remote password information	Information on the remote password.
	File password information	Information on the file password.
	Disconnected IP address information	Information on the disconnected IP address.
	Drive and file information	Information on drive names and file names.
	Operation target information	Information about the operation target (I/O No.).
Detailed information 3	—	—

Event history list

The following table lists events related to the Motion CPU.

Event code	Event type	Event category	Detected event	Description	Detailed information		
					Detailed information 1	Detailed information 2	Detailed information 3
0100	System	Information	Link-up	The Motion CPU has been entered into the link-up state as a result of operation such as connection of the network cable from an external device.	Operation initiator information	Communication speed and communication mode	—
0110			TCP connection communication start/ end	Communication with an external device through TCP connection has been started. Or, communication with an external device through TCP connection has been terminated.		Communication status	
0120			FTP connection start/ disconnection	FTP connection with an external device has been started. Or, FTP connection with an external device has been disconnected.			
0130			Receive frame error	A receive frame error has been detected.		—	
0140			SNTP server time synchronization failure	Time setting by the time synchronization function time has been failed because there was no response from the SNTP server.			
07FC			Override ratio "0"	• The override ratio is "0" when starting. • The override ratio was changed to "0" when controlling.	Axis control event information		
07FD			Operation cycle change	Operation cycle will be changed to the time (measured) [μs] automatically because the servo amplifier which unsupported to setting operation cycle (time (setting value) [μs]) has been connected.	Time information		
07FE			Home position return request OFF to ON[*1]	Home position return request is ON.	Home position return information		
07FF			Disconnect normal connection with SSCNETⅢ(/H)[*2]	SSCNETⅢ(/H) communication has been disconnected by connection function or re-connection after disconnecting function.	SSCNETⅢ(/H) communication information	Communication status	
0800		Warning	Link-down	The Motion CPU has been entered into the link-down state as a result of operation such as disconnection of the network cable from an external device.	Operation initiator information	Communication speed and communication mode	
0904			Socket communications send error	Sending a message over socket communication failed.		—	
0906			Alive check error	Alive check of the target device could not be completed within the period specified by the response monitoring timer value.			
0907			Divided message reception timeout error	• All the data could not be received within the period specified by the response monitoring timer value. • Data as long as the data length could not be received. • The remaining part of the message divided at the TCP/IP level could not be received within the period specified by the response monitoring timer value.			

Event code	Event type	Event category	Detected event	Description	Detailed information		
					Detailed information 1	Detailed information 2	Detailed information 3
0908	System	Warning	IP composition timeout error	An IP composition timeout error occurred (the remaining part of the divided data could not be received to cause the time-out).	Operation initiator information	—	—
0909			TCP-specified port number error	A port number being used for opened connection was set (for TCP/IP).			
090A			UDP-specified port number error	A port number being used for opened connection was set (for UDP/IP).			
0FFD			Over Heat Warning	The temperature of Motion CPU module became abnormal status.	—		
0FFE			Disconnected during Ethernet communication	Ethernet has been disconnected.	Operation initiator information		
0FFF			Disconnected SSCNETⅢ(/H) communication*2	SSCNETⅢ(/H) communication has been disconnected.	SSCNETⅢ(/H) communication information		
1000 -		Error	The error details when a self-diagnostic error occurs are stored as an event.				
10100	Security	Information	Security key registration/deletion	A security key was registered or deleted.	Operation initiator information	Security key operation information	—
10200			Remote password lock	The lock processing for the remote password was performed.		Remote password information	
10201			Remote password information unlock successful	The unlock processing for the remote password was performed and completed successfully.			
10202			Remote password unlock failed	The lock processing for the remote password was performed and was not completed successfully.			
10300			Access from address prohibited by IP filter setting accepted	Access from an IP address for which access is prohibited by the IP filer setting was accepted.		Disconnected IP address information	
10400			File password registration/change/deletion successful	Registration, change, or deletion of a file password was performed and completed successfully.		File password information	
10401			File password registration/change/deletion failed	Registration, change, or deletion of a file password was performed and was not completed successfully.			
10402			File password clear successful	Clear of a file password was performed and completed successfully.			
10403			File password clear failed	Clear of a file password was performed and was not completed successfully.			
10500			Forced disable applied	Forced disable was enabled.	—	—	
10501			Forced disable clear	Forced disable was disabled.			

Event code	Event type	Event category	Detected event	Description	Detailed information		
					Detailed information 1	Detailed information 2	Detailed information 3
20100	Operation	Information	Error clear	Error clear was performed.	Operation initiator information	Operation target information	—
20200			Event history clear	The event history was cleared.		—	
20300			SD memory card enabled	The SD memory card was enabled.	—		
20301			SD memory card forced disabled	The SD memory card forced disable function was performed and the SD memory card is ready for removal.			
27FFC			Parameter change	Switch the parameter file according to parameter switching function.	Parameter change information	Drive and file information	
27FFD			Write transient command	Transient command transmission (write) executes to servo amplifier.	Transient command information	—	
27FFE			Write project*3	Wrote project data.	Operation initiator information	Drive and file information	
27FFF			Motion controller OS change*4	Changed the Motion controller OS.	OS version information	—	

*1 For home position return request ON by a servo amplifier connection in an incremental system, the information for several axes is recorded in one record when SSCNETⅢ(/H) is established.

*2 When the disconnection of several axes in the same operation cycle is detected, all disconnected axes are recorded in one record. (Disconnected axis information can be checked as detailed information.)

*3 When project data is written with "CPU write" in MT Developer2, separate file names are not recorded.

*4 After installation, the operating system software is recorded when started up in normal mode. When the operating system software before change does not support this event, the operating system software version before change is not displayed correctly.

Appendix 3 Special Relays

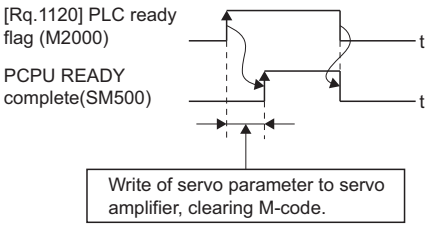
Special relays are internal relays whose applications are fixed in the Motion CPU. For this reason, they cannot be used in the same way as the normal internal relays by the Motion SFC programs. However, they can be turned ON/OFF as needed in order to control the Motion CPU.

The headings in the table that follows have the following meanings.

Item	Explanation
No.	Indicates the device No. of the special relay.
Name	Indicates the name of the special relay.
Meaning	Indicates the nature of the special relay.
Details	Indicates detailed information about the nature of the special relay.
Set by (When set)	Indicates whether the relay is set by the system or user, and, if it is set by system, when setting is performed. <Set by> • S: Set by system (Motion CPU) • U: Set by user (Motion SFC program or test operation using MT Developer2) • S/U: Set by both system (Motion CPU) and user <When set> Indicated only if setting is done by system (Motion CPU). • Main process: Set during each main processing (free time processing of the CPU) • Initial process: Set only during initial processing (when power supply is turned ON, or when executed the reset) • Status change: Set only when there is a change in status • Error: Set when error is occurred. • Request: Set only when there is a user request (Special relay, etc.) • Write: Set when there is writing from a user. • Operation cycle: Set during each operation cycle of the Motion CPU.

No.	Name	Meaning	Details	Set by (When set)
SM0	Latest self diagnostics error	OFF: No error ON: Error	• Turn ON if an error occurs as a result of self-diagnosis. • Remains ON even if the condition is restored to normal thereafter. • After confirming the error details, turn OFF by "Error reset (SM50)" ON to OFF except for the stop error.	S (Occur an error)
SM1	Latest self diagnostics error	OFF: No self diagnostic error ON: Self diagnostic error	• Turn ON if an error occurs as a result of self-diagnosis. • Remains ON even if the condition is restored to normal thereafter. • After confirming the error details, turn OFF by "Error reset (SM50)" ON to OFF except for the stop error.	
SM4	Warning detection	OFF: No warning ON: Warning	• Turn ON if a warning occurs as a result of self-diagnosis. • Remains ON even if the condition is restored to normal thereafter. • After confirming the error details, turn OFF by "Error reset (SM50)" ON to OFF except for the stop error.	S (Occur a warning)
SM50	Error reset	OFF to ON : Error reset request ON to OFF: Error reset complete	• Error is reset at OFF to ON. • Turns ON to OFF when error reset is complete.	S/U(Status change)
SM53	AC/DC DOWN	OFF: AC/DC DOWN not detected ON: AC/DC DOWN detected	• Turn ON if an instantaneous power failure of within 20[ms] occurs during use of the AC power supply module. Reset when the power supply is switched OFF, then ON. • Turn ON if an instantaneous power failure of within 10[ms] occurs during use of the AC power supply module. Reset when the power supply is switched OFF, then ON.	S (Occur an error)
SM56	Instruction execution fault	OFF: Normal ON: Instruction execution error	• Turn ON if an instruction execution error type error occurs. • Remains ON even if the condition is restored to normal thereafter.	
SM61	I/O module verify error	OFF: Normal ON: Error	• Turn ON if the I/O module status differs from that registered when the power was turned ON. • Remains ON even if the condition is restored to normal thereafter.	
SM80	Detailed information 1: Flag in use	OFF: Not used ON: Used	"Turns ON if there is any detailed information when "Latest self diagnostics error (SM0)" turns ON.	S (status change)
SM112	Detailed information 2: Flag in use			
SM203	STOP contact	OFF: Other than STOP status ON: STOP status	Turns ON when the status is STOP.	

No.	Name	Meaning	Details	Set by (When set)
SM213	Clock data read request	OFF: Non-processing ON: Read request	When this relay is ON, clock data is read to SD210 to SD216 as BCD values.	U
SM220[*1]	CPU No.1 READY complete	OFF: CPU No.1 READY incompletion ON: CPU No.1 READY completion	Turn ON when access to No. 1 PLC module is enabled from other CPU modules when the Multiple system power supply is turned ON or reset.	S (Change status)
SM221[*1]	CPU No.2 READY complete	OFF: CPU No.2 READY incompletion ON: CPU No.2 READY completion	Turn ON when access to No. 2 PLC module is enabled from other CPU modules when the Multiple system power supply is turned ON or reset.	
SM222[*1]	CPU No.3 READY complete	OFF: CPU No.3 READY incompletion ON: CPU No.3 READY completion	Turn ON when access to No. 3 PLC module is enabled from other CPU modules when the Multiple system power supply is turned ON or reset.	
SM223[*1]	CPU No.4 READY complete	OFF: CPU No.4 READY incompletion ON: CPU No.4 READY completion	Turn ON when access to No. 4 PLC module is enabled from other CPU modules when the Multiple system power supply is turned ON or reset.	
SM230	No.1 CPU error	OFF: CPU No.1 normal ON: CPU No.1 during stop error	• Goes OFF when the CPU No.1 is normal. (Including a continuation error) • Comes ON when the CPU No.1 is during stop error.[*2]	
SM231	No.2 CPU error	OFF: CPU No.2 normal ON: CPU No.2 during stop error	• Goes OFF when the CPU No.2 is normal. (Including a continuation error) • Comes ON when the CPU No.2 is during stop error.[*2]	
SM232	No.3 CPU error	OFF: CPU No.3 normal ON: CPU No.3 during stop error	• Goes OFF when the CPU No.3 is normal. (Including a continuation error) • Comes ON when the CPU No.3 is during stop error.[*2]	
SM233	No.4 CPU error	OFF: CPU No.4 normal ON: CPU No.4 during stop error	• Goes OFF when the CPU No.4 is normal. (Including a continuation error) • Comes ON when the CPU No.4 is during stop error.[*2]	
SM240	No.1 CPU resetting	OFF: CPU No.1 reset cancel ON: CPU No.1 resetting	• Goes OFF when reset of the No.1 CPU module is cancelled. • Comes ON when the No.1 CPU module is resetting (including the case where the CPU module is removed from the base). • The other CPUs are also put in reset status.	
SM241	No.2 CPU resetting	OFF: CPU No.2 reset cancel ON: CPU No.2 resetting	• Goes OFF when reset of the No.2 CPU module is cancelled. • Comes ON when the No.2 CPU module is resetting (including the case where the CPU module is removed from the base). • The other CPUs are also put in reset status.	
SM242	No.3 CPU resetting	OFF: CPU No.3 reset cancel ON: CPU No.3 resetting	• Goes OFF when reset of the No.3 CPU module is cancelled. • Comes ON when the No.3 CPU module is resetting (including the case where the CPU module is removed from the base). • The other CPUs are also put in reset status.	
SM243	No.4 CPU resetting	OFF: CPU No.4 reset cancel ON: CPU No.4 resetting	• Goes OFF when reset of the No.4 CPU module is cancelled. • Comes ON when the No.4 CPU module is resetting (including the case where the CPU module is removed from the base). • The other CPUs are also put in reset status.	
SM360	Over heat warning latch	OFF: Normal ON: Abnormal	Turn ON when the temperature of Motion CPU module becomes specified value or more. Remains ON even if normal status is restored.	S (Occur an error)
SM361	Over heat warning	OFF: Normal ON: Abnormal	Turn ON when the temperature of Motion CPU module becomes specified value or more. Turn OFF when the temperature of Motion CPU module returns to normal.	
SM400	Always ON	ON ———— OFF	Normally is ON.	S (Main processing)
SM401	Always OFF	ON OFF ————	Normally is OFF.	

No.	Name	Meaning	Details	Set by (When set)
SM480	Motion CPU operation cycle over	OFF: No motion operation cycle over occurrence (Normal) ON: Motion operation cycle over occurrence	• Turn ON when the motion operation process (including inter-module synchronization process) is not completed within the motion operation cycle. It is equivalent to "[St.1046] Operation cycle over flag (M2054)". This flag is valid even when inter-module synchronization is not used. • Remains ON even if operating within the inter-module synchronization cycle thereafter. (Clear with power supply OFF to ON, or reset)	S (Change status)
SM484	Fixed scan data transmission section over	OFF: No fixed scan data transmission section over occurrence (Normal) ON: Fixed scan data transmission section over	• Turn ON when the motion operation process is not completed by the fixed scan data transmission set in the Multiple CPU synchronous cycle. • Remains ON even if the motion operation cycle is completed by the fixed scan data transmission set in the Multiple CPU synchronous cycle thereafter. (Clear with power supply OFF to ON, or reset)	
SM488	Inter-module synchronization signal error detection	OFF: No inter-module synchronization signal error detection occurrence (Normal) ON: Inter-module synchronization signal error detection occurrence	• Turn ON when the inter-module synchronization signal cannot be confirmed in the inter-module synchronization cycle set by the parameters, or when inter-module synchronization signal is confirmed multiple times in the inter-module synchronization cycle. • Remains ON even if the inter-module synchronization signal is confirmed in the inter-module synchronization cycle thereafter. (Clear with power supply OFF to ON, or reset)	
SM500	PCPU READY complete	ON: PCPU READY completion OFF: PCPU READY incompletion	• When the "[Rq.1120] PLC ready flag (M2000)" turn OFF to ON, the fixed parameters, servo parameters and limit switch output data, etc., are checked, and if no error is detected, this flag turns ON. Also performs write of servo parameters to the servo amplifier, and clearing of M-codes. • "[Rq.1120] Turn OFF with PLC ready flag (M2000)" OFF.  	S (Request)
SM501	Test mode ON	ON: TEST mode ON OFF: Except TEST mode	• Judge whether TEST mode ON or not using MT Developer2. Used for interlock conditions, etc. when performing servo program start with a Motion SFC program.	
SM502	External forced stop input	ON: Forced stop OFF OFF: Forced stop ON	• Confirm forced stop ON/OFF. • If an external forced stop is input during positioning, the feed current value becomes the same value as the actual current value. Simultaneously, "[Rq.1123] All axes servo ON command (M2042)" turns OFF and so the servo turns OFF. As the rapid stop deceleration time progresses after the forced stop input, the feed current value returns to the current value at the moment the forced stop occurred. • If the forced stop is cancelled while the rapid stop deceleration time isn't progressing, an overspeed or error excessive may occur.	S (Operation cycle)
SM505	Cam data operation flag	OFF: Cam data not operating ON: Cam data operating	• Turn ON during cam data writing by executing the cam data write (CAMWR)/cam auto-generation (CAMMK). • Turns ON during file transfer with the file transfer function.	S (Change status)
SM506	External forced stop input ON latch	ON: External forced stop input is detected OFF: External forced stop input is not detected	• Turn ON when an external forced stop input is detected. • Remains ON even if the condition is cancelled to thereafter. • The forced stop input ON latch flag is reset with the Motion SFC program.	
SM508	Amplifier-less operation status	ON: During amplifier-less operation OFF: During normal operation	Confirm the amplifier-less operation status.	S (Main processing)

No.	Name	Meaning	Details	Set by (When set)
SM512	Motion CPU WDT error	ON: Abnormal OFF: Normal	• Turn ON when a "watchdog timer error" is detected by the Motion CPU self-diagnosis function. When the Motion CPU detects a WDT error, it executes an immediate stop without deceleration of the operating axes. • The Multiple CPU system is reset when this relay turns ON. If this relay is ON even after resetting, an error occurs at the Motion CPU. • The error cause is stored in the "Motion CPU WDT error cause (SD512)".	S (Occur an error)
SM532	SSCNETⅢ searching flag (Line 1)	OFF: Search complete ON: Searching	• Turns ON when searching axes that have been set to line 1 by system setting. • Turns OFF when all axes that have been set to line 1 by system setting have been searched.	S (Change status)
SM533	SSCNETⅢ searching flag (Line 2)	OFF: Search complete ON: Searching	• Turns ON when searching axes that have been set to line 2 by system setting. • Turns OFF when all axes that have been set to line 2 by system setting have been searched.	
SM561	Multiple CPU advanced synchronous control initial complete flag	OFF: Multiple CPU advanced synchronous initial incomplete ON: Multiple CPU advanced synchronous initial complete	Turns ON when the initial processing of Multiple CPU advanced synchronous control is completed.	S (Initial processing)
SM600	Memory card enabled/disabled flag	OFF: Disabled ON: Enabled	This relay is on when an SD memory card is enabled (This relay switches to on when a valid SD memory card is attached and prepared for use).	S (Change status)
SM601	Memory card protect flag	OFF: Not protected ON: Protected	This relay is on when the write protect switch of the SD memory card is set to on.	
SM603	Memory card (drive 2) flag	OFF: No SD memory card inserted ON: SD memory card inserted	This relay is on when an SD memory card is attached (This relay switches to on when an SD memory card is attached regardless of its state (enabled/disabled) and type).	
SM605	Memory card remove/ attach prohibit flag	OFF: Allowed to remove/ attach ON: Not allowed to remove/attach	This relay can be switched to on when prohibiting the SD memory card from being removed/attached. When this relay is on, if is set to on, the system switches it to off.	S/U
SM606	SD memory card forced disable instruction	OFF: Cancel instruction ON: Forced disable instruction	• This relay can be switched to on to issue the instruction that forces the SD memory card to be disabled. However, whenever any function accesses the SD memory card, the disabling process does not start until the access is completed. • This relay can be switched to off to cancel the instruction that forces the SD memory card to be disabled.	U
SM607	SD memory card forced disable state flag	OFF: Not disabled by the SD memory card forced disable instruction ON: Disabled by the SD memory card forced disable instruction	• This relay switches to on when the SD memory card is disabled by switching SM606 to on. • This relay switches to off when the forcibly disabled SD memory card is enabled by switching SM606 to off.	S (Change status)
SM634	Number of rewriting operations error to data memory flag	OFF: The number of rewriting operations reaches100000 ON: The number of rewriting operations is lower than 100000	This relay switches to on when the number of data memory rewriting operations reaches 100000 (CPU module must be replaced).	S (Written)
SM752	EI flag	OFF: During DI ON: During EI	Turn ON at EI instruction execution.	U

No.	Name	Meaning	Details	Set by (When set)
SM760	Sampling settings RUN status	OFF: STOP ON: RUN	Turn ON when sampling is started. Turn OFF when saving of the sampling results is complete.	S (Change status)
SM761	Sampling settings trigger status	OFF: Before trigger ON: After trigger	Turn ON when trigger conditions are established. Remains ON even when sampling is complete, and turn OFF when starting sampling.	
SM762	Saving sampling settings	OFF: Not saving ON: Saving	Turn ON while saving data in the buffer data to the storage target when performing sampling.	
SM765	Sampling settings sampling error	OFF: No error ON: Error	Turn ON when sampling error occurs. Turn OFF when the next sampling is started.	
SM805	Rapid stop deceleration time setting error invalid flag	OFF: Setting error valid ON: Setting error invalid	When this relay is ON, the large value than deceleration time can be set as rapid stop deceleration time. (The servo program setting error (error code: 51) will not occur.)	U
SM860	Sampling settings RUN request	OFF: STOP ON: RUN	Requests sampling. By turning from OFF to ON after setting the "Sampling settings storage target (SD860)", sampling is started. Sampling is stopped by turning the device OFF during sampling. This device does not change even when sampling is complete. This device is ignored even if turned from OFF to ON while the "Sampling settings RUN status (SM760)" is ON.	

*1 Used for interlock conditions to access CPU modules No.1 to 4 if set to asynchronous in the Multiple CPU synchronization settings.

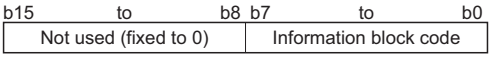
*2 To remove the stop error, remove the error factor then reset and remove reset for CPU No.1.

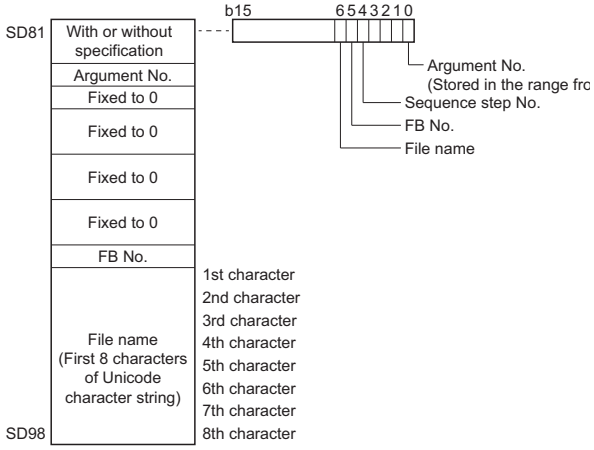
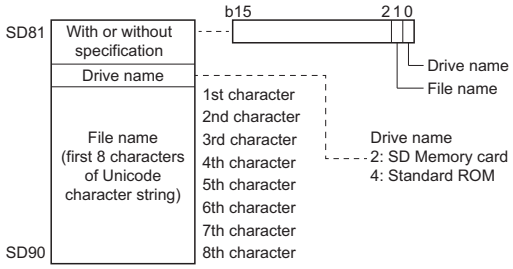
Appendix 4 Special Registers

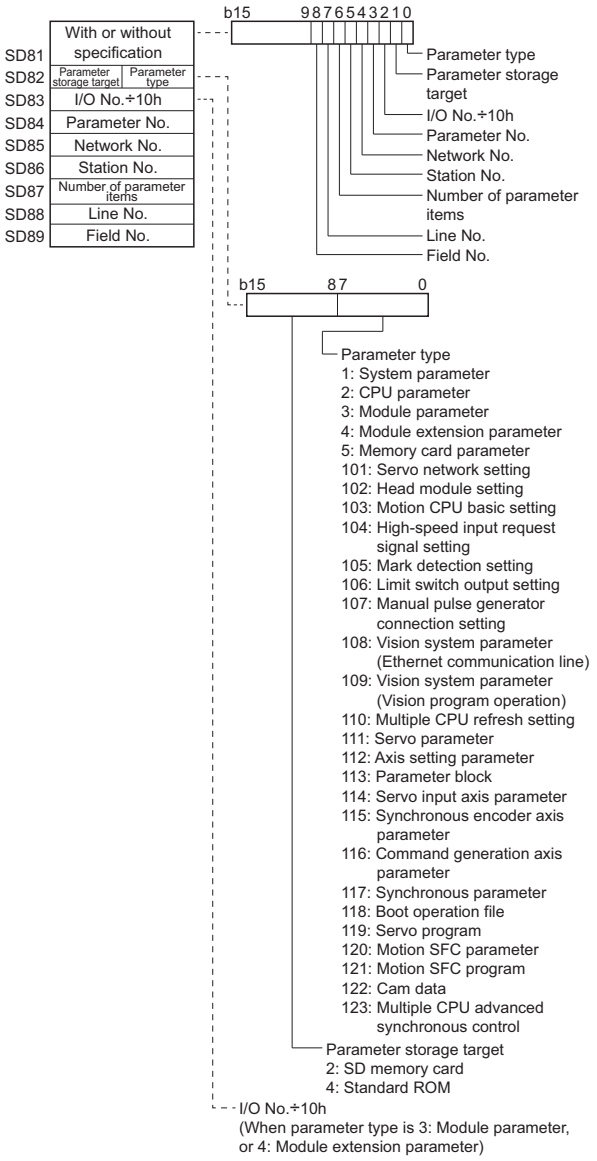
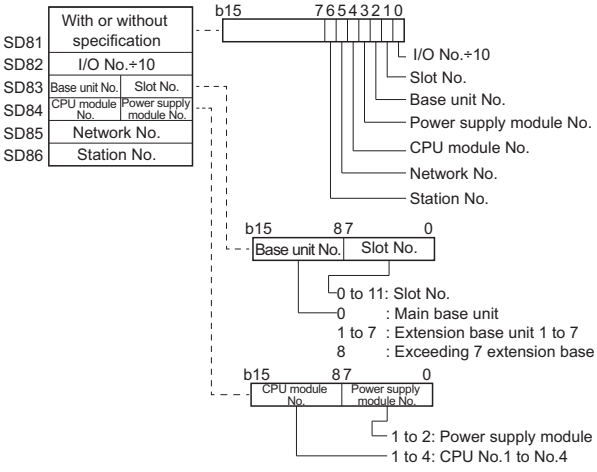
Special registers are internal registers whose applications are fixed in the Motion CPU. For this reason, it is not possible to use these registers in Motion SFC programs in the same way that normal registers are used. However, data can be written as needed in order to control the Motion CPU. Data stored in the special registers are stored as BIN values if no special designation has been made to the contrary.

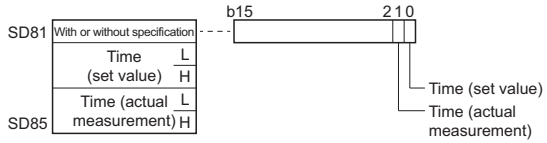
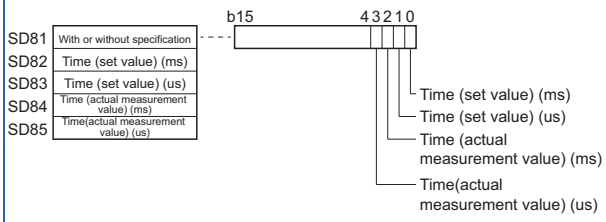
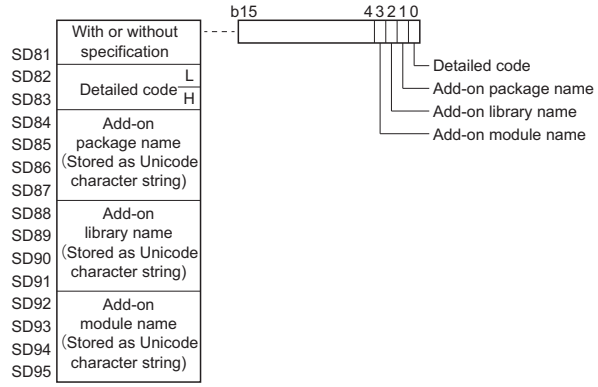
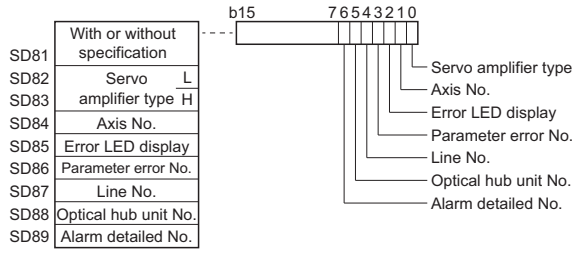
The headings in the table that follows have the following meanings.

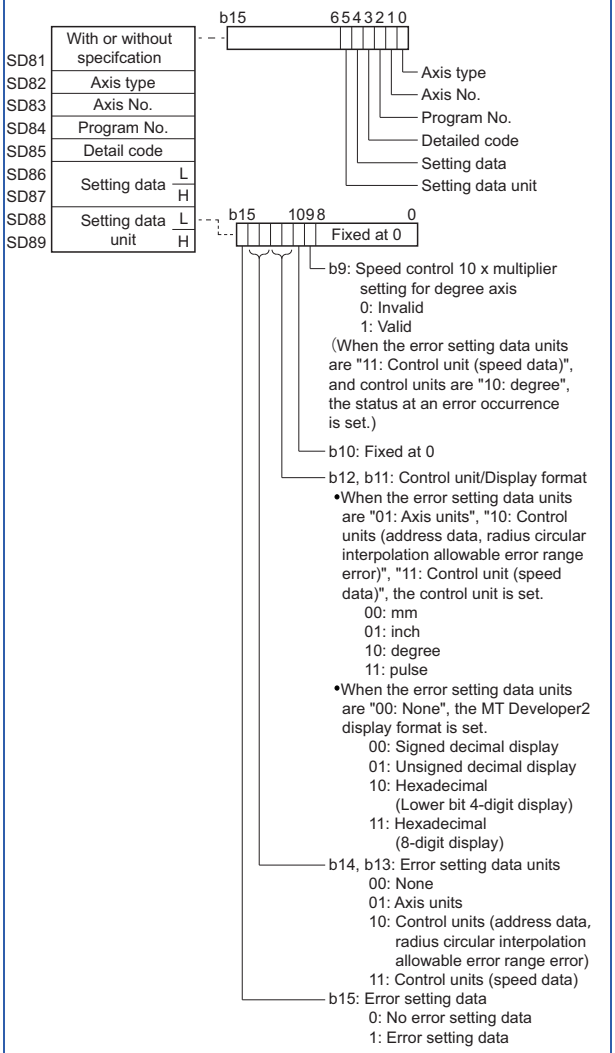
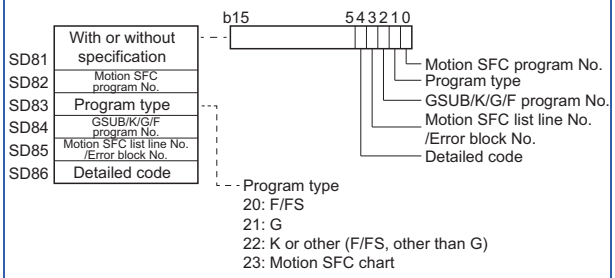
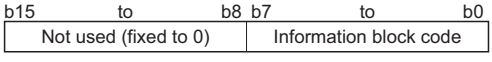
Item	Explanation
Number	Indicates the No. of the special register.
Name	Indicates the name of the special register.
Meaning	Indicates the nature of the special register.
Details	Indicates detailed information about the nature of the special register.
Set by (When set)	Indicates whether the register is set by the system or user, and, if it is set by system, when setting is performed. <Set by> S: Set by system (Motion CPU) U: Set by user (Motion SFC program or test operation using MT Developer2) S/U: Set by both system (Motion CPU) and user <When set> Indicated only if setting is done by system (Motion CPU). Main process: Set during each main processing (free time processing of the CPU) Initial process: Set only during initial processing (when power supply is turned ON, or when executed the reset) Status change: Set only when there is a change in status Error: Set when error is occurred. Write: Set when there is writing from a user. Request: Set only when there is a user request (Special relay, etc.) Operation cycle: Set during each operation cycle of the Motion CPU.

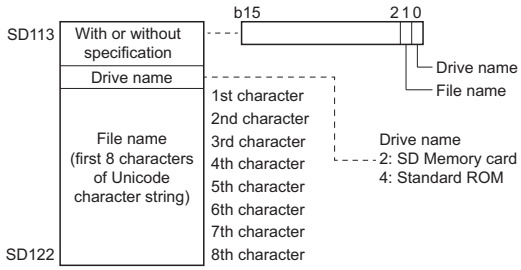
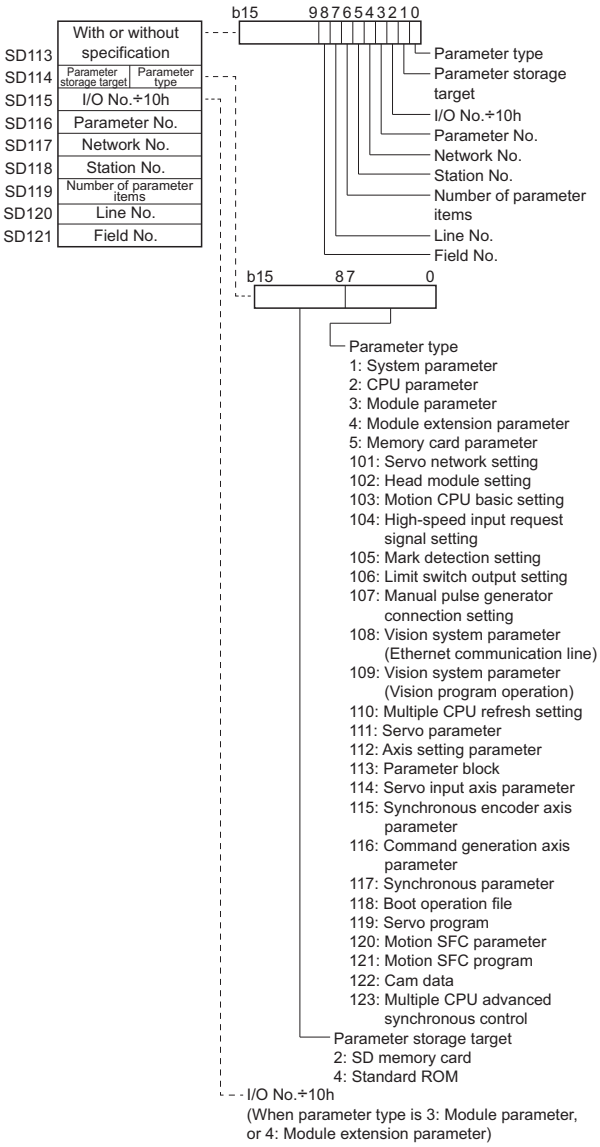
No.	Name	Meaning	Details	Set by (When set)
SD0	Latest self diagnostics error code	Latest self diagnostic error code	• Error codes for errors found by diagnosis are stored as hexadecimal notation data. • After confirming the error details, clear SD0 to SD26 by "Error reset (SM50)" OFF to ON except for the stop error.	S (Occur an error)
SD1	Clock time for latest self-diagnostic error occurrence	Clock time for latest self-diagnostic error occurrence	The year (four digits) that SD0 data was updated is stored as BIN code.	
SD2			The month that SD0 data was updated is stored as BIN code.	
SD3			The day that SD0 data was updated is stored as BIN code.	
SD4			The hour that SD0 data was updated is stored as BIN code.	
SD5			The minute that SD0 data was updated is stored as BIN code.	
SD6			The second that SD0 data was updated is stored as BIN code.	
SD7			The day of the week that SD0 data was updated is stored as BIN code. (0:Sunday,1:Monday,2:Tuesday,3:Wednesday,4:Thursday,5:Friday, 6:Saturday)	
SD10	Self-diagnostic error code	Self-diagnostic error code 1	The maximum of 16 types of error codes are stored into SD10 onwards when the diagnostics detects an error. (The same error code as one already stored in SD10 onwards is not stored). The 17th error code onwards are not stored. Also error codes are not stored when 16 types of error codes have already been stored into SD10 to SD25.	
SD11		Self-diagnostic error code 2		
SD12		Self-diagnostic error code 3		
SD13		Self-diagnostic error code 4		
SD14		Self-diagnostic error code 5		
SD15		Self-diagnostic error code 6		
SD16		Self-diagnostic error code 7		
SD17		Self-diagnostic error code 8		
SD18		Self-diagnostic error code 9		
SD19		Self-diagnostic error code 10		
SD20		Self-diagnostic error code 11		
SD21		Self-diagnostic error code 12		
SD22		Self-diagnostic error code 13		
SD23		Self-diagnostic error code 14		
SD24		Self-diagnostic error code 15		
SD25		Self-diagnostic error code 16		
SD53	AC/DC DOWN detection	Number of times for AC/DC DOWN detection	• Every time the input voltage fails to or below (85[%] AC power/65[%] DC power) the rating during calculation of the Motion CPU module, the value is incremented by 1 and stored in BIN code. • The counter repeats a 0 to 65535 to 0 pattern.	
SD61	I/O module verify error module number	I/O module verify error module number	The lowest I/O number of the module which has an error detected by the I/O module verification is stored.	
SD80	Detailed information 1 information category	Detailed information 1 information category code	• Detailed information 1 information category code is stored.  • The following codes are stored into the information category code. 0: N/A 1: Program position information 2: Drive and file information 4: Parameter information 5: System configuration information 6: Number of times information 7: Time information 135: Add-on function information 141: Servo error/error at communication failure 142: Axis control error 143: Motion SFC program	

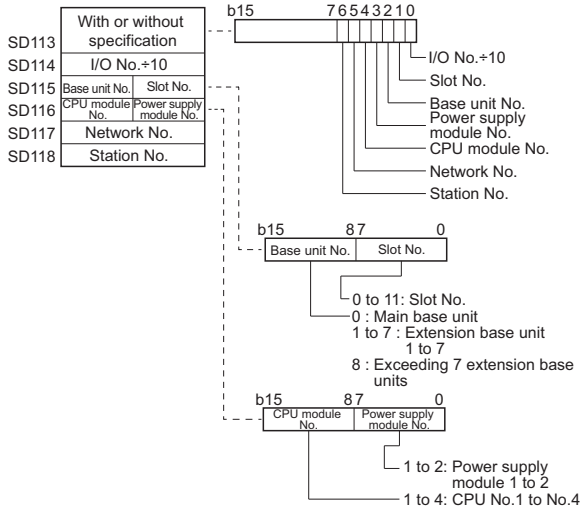
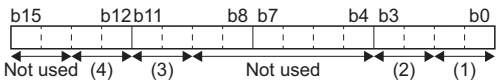
No.	Name	Meaning	Details	Set by (When set)
SD81 to SD111	Detailed information 1	Detailed information 1	• Detailed information 1 corresponding to the error code (SD0) is stored. • There are ten types of information to be stored as shown in the following figures: • The type of the detailed information 1 can be obtained using SD80 (the value of the "Detailed information 1 information category code" stored in SD80 corresponds to the following figures ((1), (2), (4) to (7), (135), (141) to (143)). • SD81 can be used for determining whether there is detailed information stored in SD82 or after. (Detailed information: 1/No detailed information: 0) (1) Program position information  (2) Drive and file information  	S (Occur an error)

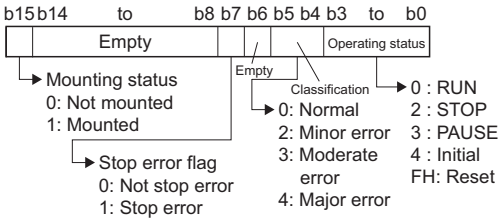
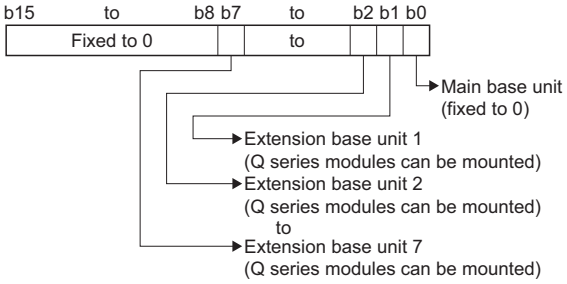
No.	Name	Meaning	Details	Set by (When set)
SD81 to SD111	Detailed information 1	Detailed information 1	(4) Parameter information  (5) System configuration information  	S (Occur an error)

No.	Name	Meaning	Details	Set by (When set)
SD81 to SD111	Detailed information 1	Detailed information 1	(6) Number of times information  (7) Time information  (135) Add-on function information  (141) Servo error/error at communication failure  	S (Occur an error)

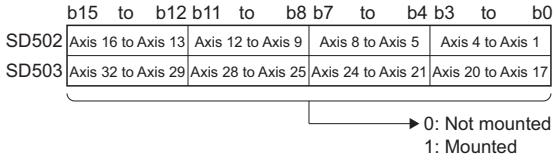
No.	Name	Meaning	Details	Set by (When set)
SD81 to SD111	Detailed information 1	Detailed information 1	(142) Axis control related error  (143) Motion SFC program 	S (Occur an error)
SD112	Detailed information 2 information category	Detailed information 2 information category code	• Detailed information 2 information category code is stored.  • The following codes are stored into the information category code. 0: N/A 2: Drive and file information 4: Parameter information 5: System configuration information	

No.	Name	Meaning	Details	Set by (When set)
SD113 to SD143	Detailed information 2	Detailed information 2	• Detailed information 2 corresponding to the error code (SD0) is stored. • There are three types of information to be stored as shown in the following figures: • The type of the detailed information 2 can be obtained using SD112 (the value of the "Detailed information 2 information category code" stored in SD112 corresponds to the following figures ((2), (4), (5)). • SD113 can be used for determining whether there is detailed information stored in SD114 or after. (Detailed information: 1/No detailed information: 0) (2) Drive and file information  (4) Parameter information 	S (Occur an error)

No.	Name	Meaning	Details	Set by (When set)
SD113 to SD143	Detailed information 2	Detailed information 2	(5) System configuration information 	S (Occur an error)
SD200	Status of switch	Status of CPU switch	The Motion CPU switch status is stored as shown below. 0: RUN 1: STOP	S (At switch change)
SD201	LED status	CPU-LED state	This register stores the information that indicates LED status (0: off, 1: on, 2: flashing) of the CPU module in the following bit patterns.  (1) READY (2) ERROR (3) CARD READY (4) CARD ACCESS	S (Change status)
SD203	Operating status of CPU	Operating status of CPU	The CPU module operating status is stored as shown below. 0: RUN 2: STOP	S (Main processing)
SD210	Clock data	Clock data (Year)	The year (four digits) is stored as BIN code.	S/U (Request)
SD211		Clock data (Month)	The month is stored as BIN code.	
SD212		Clock data (Day)	The day is stored as BIN code.	
SD213		Clock data(Hour)	The hour is stored as BIN code.	
SD214		Clock data(Minute)	The minute is stored as BIN code.	
SD215		Clock data(Second)	The second is stored as BIN code.	
SD216		Clock data(Day of week)	The day of the week is stored as BIN code. (0:Sunday, 1:Monday, 2:Tuesday, 3:Wednesday, 4:Thursday, 5:Friday, 6:Saturday)	

No.	Name	Meaning	Details	Set by (When set)
SD218	Time zone setting value	Time zone(in minutes)	The time zone setting value specified in the parameter is stored in increments of minutes. Example: when the setting value of the time zone is "UTC+9": 9 × 60 (minutes) = 540 SD218 = 540	S (Initial process)
SD228	Multiple CPU system information	Number of CPU modules	The number of CPU modules which constitute a multiple CPU system is stored (one to four, including those reserved).	
SD229		CPU module number in Multiple CPU system	The number of this CPU No. is stored when a multiple CPU system is configured.	
SD230		CPU No.1 operating status	The operation information for each CPU No. is stored (the amount of stored information depending on the number of CPU modules indicated in SD228 is stored). 	S (Main process /Occur an error)
SD231		CPU No.2 operating status		
SD232		CPU No.3 operating status		
SD233		CPU No.4 operating status		
SD241	Number of extension base units	0: base unit only 1 to 7: number of extension base units	The maximum number of implemented extension base units is stored.	S (Initial processing)
SD242	Identification for whether or not Q series module can be mounted	Identification of the base type 0: Q series module cannot be mounted (There is no base unit that can mount the Q series unit) 1: Q series module can be mounted (There is a base unit that can mount the Q series unit)	Identify whether or not Q series module can be mounted. When no SD memory card is inserted, the value is fixed to 0. 	
SD243	Number of base slots	Number of base slots	The number of slots of the base unit, which is specified in the Base/power supply /extension cable setting of system parameters, is stored. When the number of slots of the base unit is not specified by the system parameter, that of the mounted base unit is stored. b15 to b12 b11 to b8 b7 to b4 b3 to b0 SD243: Extension 3 | Extension 2 | Extension 1 | Main SD244: Extension 7 | Extension 6 | Extension 5 | Extension 4	
SD244				
SD250	Latest I/O for implemented unit	Latest I/O number for implemented unit	The most significant two digits of the value obtained by adding one to the latest I/O number for an implemented unit are stored as a BIN value.	

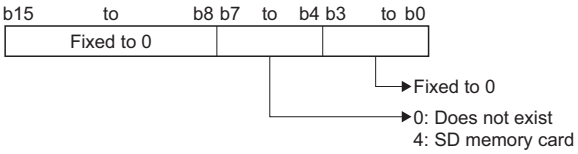
No.	Name	Meaning	Details	Set by (When set)
SD260	Number of points assigned to bit device	X number of points assigned (L)	The number of points of the device X currently set is stored as 32-bit data.	S (Initial processing)
SD261		X number of points assigned (H)		
SD262		Y number of points assigned (L)	The number of points of the device Y currently set is stored as 32-bit data.	
SD263		Y number of points assigned (H)		
SD264		M number of points assigned (L)	• The number of points of the device M currently set is stored as 32-bit data. • The number of points assigned is stored even when the number of points assigned to M is 32K points or less.	
SD265		M number of points assigned (H)		
SD266		B number of points assigned (L)	• The number of points of the device B currently set is stored as 32-bit data. • The number of points assigned is stored even when the number of points assigned to B is 32K points or less.	
SD267		B number of points assigned (H)		
SD270		F number of points assigned (L)	The number of points of the device F currently set is stored as 32-bit data.	
SD271		F number of points assigned (H)		
SD280	Word device number of points assigned	D number of points assigned (L)	• The number of points of the device D currently set is stored as 32-bit data. • The number of points assigned is stored even when the number of points assigned to D is 32K points or less.	
SD281		D number of points assigned (H)		
SD282		W number of points assigned (L)		
SD283		W number of points assigned (H)		
SD480	Motion CPU operation cycle over count	0: Motion operation cycle over not occurrence (Normal) 1 to 65535: Operation cycle over cumulative count	Stores the count for the motion operation process (including inter-module synchronization process) not completed within the motion operation cycle. After exceeding 65535 the count returns to 0 and counts again. The counts are stored regardless of the "CPU module operation setting at error detected" RAS setting. This counter is valid even is inter-module synchronization is not used.	S (Change status)
SD484	Fixed scan data transmission section over count	0: Fixed scan data transmission section over not occurrence (Normal) 1 to 65535: Fixed scan data transmission section over cumulative count	Stores the count for the motion operation process not completed by the fixed-cycle data transmission set in the Multiple CPU synchronous cycle. After exceeding 65535 the count returns to 0 and counts again. The counts are stored regardless of the "CPU module operation setting at error detected" RAS setting. This counter is valid even is inter-module synchronization is not used.	

<table>
<tr><th>No.</th><th>Name</th><th>Meaning</th><th>Details</th><th>Set by (When set)</th></tr>
<tr><td>SD502
SD503</td><td>Servo amplifier loading information</td><td>Servo amplifier loading information</td><td>• The servo amplifier installation status is checked when the multiple CPU system power is turned ON, or when the system is reset, and the result is stored as bit data.
 
b15 to b12 b11 to b8 b7 to b4 b3 to b0
SD502
Axis 16 to Axis 13
Axis 12 to Axis 9
Axis 8 to Axis 5
Axis 4 to Axis 1
SD503
Axis 32 to Axis 29
Axis 28 to Axis 25
Axis 24 to Axis 21
Axis 20 to Axis 17
0: Not mounted
1: Mounted
• The system is reset when communication with the servo amplifier is interrupted.
• The mounting status of changed axis after the power supply on is stored.
• The servo amplifier installed/not installed status is as follows.
<table>
<tr><th>Status</th><th>Detail</th></tr>
<tr><td>Installed</td><td>The servo amplifier status is normal (normal communication with servo amplifier).</td></tr>
<tr><td>Not installed</td><td>The servo amplifier is not installed.
The servo amplifier control power is OFF.
Unable to successfully communicate with the servo amplifier due to a connection cable abnormality.</td></tr>
</table>
• The servo network settings and servo amplifier installation status are as follows.
<table>
<tr><th rowspan="2">Servo network settings</th><th colspan="2">Servo amplifier</th></tr>
<tr><th>Installed</th><th>Not installed</th></tr>
<tr><td>Used (axis No. settings)</td><td>1 is stored.</td><td>0 is stored.</td></tr>
<tr><td>Not used</td><td>0 is stored.</td><td>0 is stored.</td></tr>
</table></td><td>S (Operation cycle)</td></tr>
<tr><td>SD504</td><td>SSCNETⅢ/H compatible optical hub unit loading information (line 1)</td><td>SSCNETⅢ/H compatible optical hub unit loading information (line 1)</td><td rowspan="2">• Checks the connection status (Installed: 1/Not installed: 0) of the optical hub unit and stores as bit data.
SD504: b0 to b15 (Optical hub unit No. 1 to No. 16 on the first line)
SD506: b0 to b15 (Optical hub unit No. 1 to No. 16 on the second line)
*: No. 1 to No. 16 is the connection order from the Motion CPU
• "1" is stored to the installation status of an optical hub unit with a servo amplifier connected.
• "0" is stored to the installation status when an optical hub unit is not connected after an optical hub unit that is not connected to a servo amplifier, or when the optical hub unit connected after an optical hub unit is not connected to a servo amplifier either.
• For optical hub units connected before an optical hub unit connected to a servo amplifier, "1" is stored to the installation status, regardless of whether there is a servo amplifier connection or not.</td><td rowspan="2"></td></tr>
<tr><td>SD506</td><td>SSCNETⅢ/H compatible optical hub unit loading information (line 2)</td><td>SSCNETⅢ/H compatible optical hub unit loading information (line 2)</td></tr>
<tr><td>SD508</td><td>SSCNET control (Status)</td><td>• Connect/disconnect of SSCNET communication
• Start/release of amplifier-less operation</td><td>SD508 stores the executing state for connect/disconnect of SSCNET communication and start/release of amplifier-less operation.
0: Command accept waiting
-1: Execute waiting
-2: Executing</td><td>S (Main processing)</td></tr>
<tr><td>SD509</td><td>Boot file transfer information</td><td>Boot file transfer information</td><td>Stores the status of file transmission at boot when the Multiple CPU system power supply is turned ON.
0: Standard ROM write permission/read protection
1: Standard ROM write protection/read protection
2: Standard ROM write protection/read permission
3: Standard ROM write permission/read permission
256: Boot operation file invalid</td><td>S (Initial processing)</td></tr>
</table>

<table>
<tr><th>No.</th><th>Name</th><th>Meaning</th><th>Details</th><th>Set by (When set)</th></tr>
<tr><td>SD512</td><td>Motion CPU WDT error cause</td><td>Error meaning of WDT error occurs</td><td>The following error codes are stored when an error occurs at the Motion CPU.
<table>
<tr><th>Error code</th><th>Error cause</th><th>Error Operation</th><th>Corrective action</th></tr>
<tr><td>1</td><td>WDT timeout detection (Main processing)</td><td rowspan="3">All axes stop immediately, and subsequent starting is not possible.</td><td rowspan="2">• Reset the system.
• If an operation cycle over condition occurs even after resetting, or if the main cycle is too long (exceeds approx. 1.0 [s]),
(1) Change the operation cycle to a larger value in [Motion CPU Parameter] → [Basic Setting].
(2) Reduce the number of event task and NMI task command executions in the Motion SFC program.</td></tr>
<tr><td>2</td><td>WDT timeout detection (Operation cycle)</td></tr>
<tr><td>Other than the above</td><td>H/W Error</td><td>• Reset the system.
• If the error occurs even after resetting, contact your nearest system service center, dealer, or branch, and describe the situation.</td></tr>
</table></td><td>S (Occur an error)</td></tr>
<tr><td>SD520</td><td>Scan time</td><td>Scan time (unit: ms)</td><td>Main cycle is stored in the unit 1[ms].
Setting range (0 to 65535[ms])</td><td rowspan="2">S (Main processing)</td></tr>
<tr><td>SD521</td><td>Maximum scan time</td><td>Maximum scan time (1ms units)</td><td>The maximum value of the main cycle is stored in the unit 1[ms].
Setting range (0 to 65535[ms])</td></tr>
<tr><td>SD522</td><td>Motion operation cycle</td><td>Motion operation cycle</td><td>The time required for motion operations for each motion operation cycle is stored in the [μs] unit.</td><td>S (Operation cycle)</td></tr>
<tr><td>SD523</td><td>Operation cycle of the Motion CPU setting</td><td>Operation cycle of the Motion CPU setting</td><td>• The setting operation cycle is stored in the [μs] unit.
• If the "Default settings" are specified in the Motion CPU common parameter basic settings, operation cycles are stored based on the number of set axes. If 0.222[ms]/0.444[ms]/0.888[ms]/1.777[ms]/3.555[ms]/7.111[ms] is set, the operation cycle corresponding to each setting is stored.
*: If nine servo amplifiers or more are connected to 1 line on SSCNETⅢ, the 0.444[ms] operation cycle is not supported. Even if the operation cycle setting in the basic settings is 0.444[ms], the actual set operation cycle will be 0.888[ms].</td><td>S (Initial processing)</td></tr>
<tr><td>SD524</td><td>Maximum Motion operation cycle</td><td>Maximum Motion operation cycle</td><td>• After turning the power ON, the maximum amount of time taken for motion operations for each motion operation cycle is stored in [μs] units.
• If "0" is written, the maximum value is reset.</td><td>S (Operation cycle)</td></tr>
<tr><td>SD552</td><td rowspan="2">Servo parameter write/read request</td><td rowspan="2">Servo parameter read value</td><td>• The read value of servo parameter which executed "2: Read request" in "Servo parameter write/read request flag (SD804)" is stored.
• The read value (low 1 word) of servo parameter which executed "4: 2 word read request" in "Servo parameter write/read request flag (SD804)" is stored.</td><td rowspan="2">S (Read request)</td></tr>
<tr><td>SD553</td><td>The read value (high 1 word) of servo parameter which executed "4: 2 word read request" in "Servo parameter write/read request flag (SD804)" is stored.</td></tr>
</table>

No.	Name	Meaning	Details	Set by (When set)
SD554	File transfer status(status)	Data transfer status	The status of data transfer between the file and built-in memory is stored. 0: Awaiting request acceptance -1: Awaiting execution -2: Executing -1□□: Error completion *: □□ represents the following. • When servo parameters set: axis No. at which error occurred • When cam file set: fixed at 00	S (Main processing)
SD556 SD557	Servo parameter change flag	Servo parameter change flag	• The content of the servo parameter open area inside the Motion CPU changes, and number of the axis for which servo parameter file update is required is stored as bit data. b15 to b12 b11 to b8 b7 to b4 b3 to b0 SD557: Axis 16 to Axis 13 | Axis 12 to Axis 9 | Axis 8 to Axis 5 | Axis 4 to Axis 1 SD558: Axis 32 to Axis 29 | Axis 28 to Axis 25 | Axis 24 to Axis 21 | Axis 20 to Axis 17 • When the Multiple CPU system power is next turned ON, the content of the servo parameter open area for the relevant axis is automatically updated to a file. • The servo parameter files can be reflected with "File transmission request (SD820)" (After file is reflected, the bit for the relevant axis turns OFF)	
SD561	Multiple CPU advanced synchronous control setting status	Multiple CPU advanced synchronous control setting status	The CPU setting status of Multiple CPU advanced synchronous control is stored. 0: Independent CPU 1: Master CPU 2: Slave CPU	S (Initial processing)
SD562 SD563	Scan time	Scan time (1μs units)	The current main cycle is stored in 1[μs] units. 1 to 2147483647[μs]	S (Main processing)
SD564 SD565	Maximum scan time	Maximum scan time (1μs units)	• The main cycle maximum value is stored in 1[μs] units. 1 to 2147483647[μs] • If "0" is written, the maximum value is reset.	
SD566 SD567	Motion SFC normal task processing time	Normal task processing time	The Motion SFC normal task processing time during main cycles is stored in [μs] units. 1 to 2147483647[μs]	
SD568 SD569	Maximum Motion SFC normal task processing time	Normal task maximum processing time	• The Motion SFC normal task processing maximum time during main cycles is stored in [μs] units. 1 to 2147483647[μs] • If "0" is written, the maximum value is reset.	
SD570	Motion SFC event task (14.222ms) processing time	Event task (14.222ms) processing time	The processing time for each motion SFC task is stored in [μs] units. 0 to 65535[μs]	S (when executing task)
SD571	Motion SFC event task (7.111ms) processing time	Event task (7.111ms) processing time		
SD572	Motion SFC event task (3.555ms) processing time	Event task (3.555ms) processing time		
SD573	Motion SFC event task (1.777ms) processing time	Event task (1.777ms) processing time		
SD574	Motion SFC event task (0.888ms) processing time	Event task (0.888ms) processing time		
SD575	Motion SFC event task (0.444ms) processing time	Event task (0.444ms) processing time		
SD576	Motion SFC event task (0.222ms) processing time	Event task (0.222ms) processing time		
SD578	Motion SFC event task (external interrupt) processing time	Event task (external interrupt) processing time		

No.	Name	Meaning	Details	Set by (When set)
SD579	Motion SFC event task (PLC interrupt) processing time	Event task (PLC interrupt) processing time	The processing time for each motion SFC task is stored in [μs] units. 0 to 65535[μs]	S (when executing task)
SD580	Motion SFC NMI task processing time	NMI task processing time		
SD581	Fixed-cycle system processing time	Fixed-cycle system processing time	The processing time for each process is stored in [μs] units. 0 to 65535[μs]	S (Operation cycle)
SD582	Motion operation task processing time	Motion operation task processing time		
SD583	CPU refresh (I45 executing) processing time	CPU refresh (I45 executing) processing time		
SD584	Motion SFC event task time within operation cycle (14.222ms)	Event task time within operation cycle (14.222ms)	• The processing time for each Motion SFC task is stored in [μs] units. 0 to 65535[μs] • The time within the operation cycle indicates the time used for each process in one operation cycle (start of fixed-cycle system processing to end of motion operation processing). • If "[St.1046] Operation cycle over flag (M2054)" turns ON, the processing time when "[St.1046] Operation cycle over flag (M2054)" turns from OFF to ON is latched as the time within the operation cycle.	
SD585	Motion SFC event task time within operation cycle (7.111ms)	Event task time within operation cycle (7.111ms)		
SD586	Motion SFC event task time within operation cycle (3.555ms)	Event task time within operation cycle (3.555ms)		
SD587	Motion SFC event task time within operation cycle (1.777ms)	Event task time within operation cycle (1.777ms)		
SD588	Motion SFC event task time within operation cycle (0.888ms)	Event task time within operation cycle (0.888ms)		
SD589	Motion SFC event task time within operation cycle (0.444ms)	Event task time within operation cycle (0.444ms)		
SD590	Motion SFC event task time within operation cycle (0.222ms)	Event task time within operation cycle (0.222ms)		
SD592	Motion SFC event task (external interrupt) time within operation cycle	Event task (external interrupt) time within operation cycle		
SD593	Motion SFC event task (PLC interrupt) time within operation cycle	Event task (PLC interrupt) time within operation cycle		
SD594	Motion SFC NMI task time within operation cycle	NMI task time within operation cycle		
SD595	Fixed-cycle system processing time within system operation cycle	Fixed-cycle system processing time within system operation cycle	• The processing time for each process is stored in [μs] units. 0 to 65535[μs] • The time within the operation cycle indicates the time used for each process in one operation cycle (start of fixed-cycle system processing to end of motion operation processing). • If "[St.1046] Operation cycle over flag (M2054)" turns ON, the processing time when "[St.1046] Operation cycle over flag (M2054)" turns from OFF to ON is latched as the time within the operation cycle.	
SD596	Motion operation task time within operation cycle	Motion operation task time within operation cycle		
SD597	CPU refresh (I45 executing) time within operation cycle	CPU refresh (I45 executing) time within operation cycle		

<table>
<tr><th>No.</th><th>Name</th><th>Meaning</th><th>Details</th><th>Set by (When set)</th></tr>
<tr><td>SD600</td><td>Memory card mounting status</td><td>SD memory card type</td><td>This register indicates the type of mounted SD memory cards.
 
</td><td>S (Initial processing or card inserted)</td></tr>
<tr><td>SD606</td><td rowspan="2">SD memory card (drive 2) capacity</td><td>SD memory card (drive 2) capacity: the lowest digit (unit: k bytes)</td><td rowspan="2">The capacity of the SD memory card is stored in increments of 1k byte (the amount of free space for a formatted memory card is stored).</td><td rowspan="2">S (Initial processing or card mounting/ unmounting)</td></tr>
<tr><td>SD607</td><td>SD memory card (drive 2) capacity: the higher digits (unit: k bytes)</td></tr>
<tr><td>SD610</td><td rowspan="2">SD memory card (drive 2) free space</td><td>SD memory card (drive 2) free space: the lowest digit (unit: k bytes)</td><td rowspan="2">The amount of free space of the SD memory card is stored in increments of 1k byte.</td><td rowspan="2">S (Change status)</td></tr>
<tr><td>SD611</td><td>SD memory card (drive 2) free space: the higher digits (unit: k bytes)</td></tr>
<tr><td>SD622</td><td rowspan="2">Standard ROM capacity</td><td>Standard ROM capacity: lower (unit: k bytes)</td><td rowspan="2">Standard ROM capacity is stored in increments of 1k byte.
(The free space after format is stored.)</td><td rowspan="2">S (Initial processing)</td></tr>
<tr><td>SD623</td><td>Standard ROM capacity: higher (unit: k bytes)</td></tr>
<tr><td>SD624</td><td rowspan="2">Standard ROM free space</td><td>Standard ROM capacity: lower (unit: k bytes)</td><td rowspan="2">Standard ROM free space is stored in increments of 1k byte.</td><td rowspan="2">S (Change status)</td></tr>
<tr><td>SD625</td><td>Standard ROM capacity: higher (unit: k bytes)</td></tr>
<tr><td>SD634</td><td rowspan="2">Index for the number of standard ROM write operations</td><td rowspan="2">Index of the number of write operations up to now</td><td rowspan="2">• Indicates the index value for the number of write operations to the standard ROM up to now (stored as a 32-bit BIN value). However, the number of write operations is not equal to the index value.
• When the index value exceeds 100000, an error is generated (the index value is continued to be counted even when it exceeds 100000). If the index value exceeds 100000, the CPU module must be replaced.</td><td rowspan="2">S (At write)</td></tr>
<tr><td>SD635</td></tr>
<tr><td>SD700</td><td rowspan="2">Device assignment</td><td rowspan="2">Number of points assigned for #</td><td rowspan="2">Stores the number of points for device # used in the Motion CPU.</td><td rowspan="2">S (Initial processing)</td></tr>
<tr><td>SD701</td></tr>
<tr><td>SD718</td><td rowspan="2">888μs free-running timer</td><td rowspan="2">888μs free-running timer</td><td rowspan="2">Current value (SD718, SD719) is incremented by 1 every 888μs.
Read SD718 device in 2 word unit.
<table><tr><th>Item</th><th>Specification</th></tr><tr><td>Data size</td><td>2 word (-2147483648 to 2147483647)</td></tr><tr><td>Latch</td><td>Cleared to zero at power supply on or reset, counting is continued thereafter.</td></tr><tr><td>Usable tasks</td><td>Normal, event, NMI</td></tr><tr><td>Access</td><td>Read enabled only</td></tr><tr><td>Timer specifications</td><td>888μs timer</td></tr></table></td><td rowspan="2">S (Every 888μs)</td></tr>
<tr><td>SD719</td></tr>
<tr><td>SD720</td><td rowspan="2">444μs free-running timer</td><td rowspan="2">444μs free-running timer</td><td rowspan="2">Current value (SD720, SD721) is incremented by 1 per 444μs.
Read SD720 device in 2 word unit.
<table><tr><th>Item</th><th>Specification</th></tr><tr><td>Data size</td><td>2 word (-2147483648 to 2147483647)</td></tr><tr><td>Latch</td><td>Cleared to zero at power supply on or reset, counting is continued thereafter.</td></tr><tr><td>Useable tasks</td><td>Normal, event, NMI</td></tr><tr><td>Access</td><td>Read enabled only</td></tr><tr><td>Timer spesifications</td><td>444μs timer</td></tr></table></td><td rowspan="2">S (Every 444μs)</td></tr>
<tr><td>SD721</td></tr>
</table>

<table>
<tr><th>No.</th><th>Name</th><th>Meaning</th><th>Details</th><th>Set by
(When set)</th></tr>
<tr><td>SD722

SD723</td><td>222μs free-running timer</td><td>222μs free-running timer</td><td>Current value (SD722, SD723) is incremented by 1 per 222μs.
Read SD722 device in 2 word unit.<table><tr><th>Item</th><th>Specification</th></tr><tr><td>Data size</td><td>2 word (-2147483648 to 2147483647)</td></tr><tr><td>Latch</td><td>Cleared to zero at power supply on or reset, counting is continued thereafter.</td></tr><tr><td>Usable tasks</td><td>Normal, event, NMI</td></tr><tr><td>Access</td><td>Read enabled only</td></tr><tr><td>Timer specifications</td><td>222μs timer</td></tr></table></td><td>S (Every 222μs)</td></tr>
<tr><td>SD740
SD741
SD742
SD743
SD744
SD745
SD746
SD747</td><td>Operating system software version</td><td>Operating system software version</td><td>Stores the Motion CPU operating system software model and version in ASCII.
SD740 SD741 SD742 SD743 SD744 SD745 SD746 SD747
R M T F W ␣ ␣ ␣ ␣ ␣ ␣ ␣ 0 1 ␣ ␣
Model name (12 characters)
Version (4 characters)
␣: Space</td><td>S (Initial processing)</td></tr>
<tr><td>SD760</td><td>Sampling settings storage target</td><td>Sampling settings storage target</td><td>Stores the storage target for the sampling settings file being sampled.</td><td>S (Change status)</td></tr>
<tr><td>SD761</td><td>Sampling settings results save target</td><td>Sampling settings results save target</td><td>Stores the sampling results save destination for the data being sampled.
0: No sampling
1: Standard ROM
2: SD memory card</td><td></td></tr>
<tr><td>SD762</td><td>Sampling settings sampling type</td><td>Sampling settings sampling type</td><td>Stores the sampling type being sampled.
0: No sampling
1: Trigger sampling</td><td></td></tr>
<tr><td>SD764
SD765</td><td>Sampling settings latest file information</td><td>Sampling settings latest file information</td><td>Stores the latest sampling results file information (system time).
(Note): Elapsed time (seconds) up to the current time using Greenwich Mean Time 00:00:00, January 1st 1970 as the reference is stored.</td><td></td></tr>
<tr><td>SD769</td><td>Sampling settings digital oscilloscope error cause</td><td>Sampling settings digital oscilloscope error cause</td><td>The error code for the sampling error is stored. This is cleared to 0 when the next sampling is performed.
0: No error
Other than 0: Error code</td><td></td></tr>
<tr><td>SD803</td><td>SSCNET control (Command)</td><td>• Connect/disconnect of SSCNET communication
• Start/release of amplifier-less operation</td><td>Requests the connect/disconnect of SSCNET communication and start/release of amplifier-less operation.
0: No command
1 to 32: Disconnect command of SSCNET communication
-10: Connect command of SSCNET communication
-20: Start command of amplifier-less operation
-25: Release command of amplifier-less operation
-2: Execute command</td><td>U</td></tr>
<tr><td>SD804*1</td><td>Servo parameter write/read request</td><td>Servo parameter write/read request flag</td><td>• The "write/read request" is executed after setting of the axis No. and servo parameter No.
1: Write request
2: Read request
3: 2 word write request*2
4: 2 word read request*2
• "0" is automatically set by Motion CPU after completion of servo parameter write/read request. ("-1" is stored by Motion CPU at write/read error.)</td><td>S/U</td></tr>
<tr><td>SD805</td><td></td><td>Axis No.</td><td>The axis No. to write/read servo parameter is stored.
R32MTCPU: 1 to 32
R16MTCPU: 1 to 16</td><td>U</td></tr>
</table>

No.	Name	Meaning	Details	Set by (When set)
SD806	Servo parameter write/read request	Servo parameter No.	The servo parameter No. to be written/read is stored in hexadecimal. H □□□□ → Parameter No. → Parameter group No. • 0: PA • 5: PF • 1: PB • 9: Po • 2: PC • A: PS • 3: PD • B: PL (MR-J4(W)-□B only) • 4: PE • C: PT (MR-J4(W)-□B only) → Fixed to 0 • VCⅡ series use H □□□□ → Parameter No. → Parameter group No. • 0: Group 0 • 5: Group 5 • 1: Group 1 • 6: Group 6 • 2: Group 2 • 7: Group 7 • 3: Group 3 • 8: Group 8 • 4: Group 4 • 9: Group 9	U
SD807		Servo parameter value	The setting value of servo parameter to be written is stored when "1: Write request" is set in SD804.	
SD808 SD809		Servo parameter setting value (2 word)	The setting value of servo parameter to be written is stored when "3: 2 word write request" is set in SD804.	
SD820	File transmission request (command)	Read/write target data specification	Synchronizes the data in the file and the built-in memory, and requests file transfer. The type of data to be synchronized is set in hexadecimal notation. H0000: No request H1000 to H9020: Servo parameter read/write command H □□□□ → Target axis No.(1 to 32) 00 to 20 *: "00" applies to all axes → Read/write target file • 10: built-in memory to file (standard ROM) • 20: built-in memory to file (SD memory card) • 80: file (standard ROM) to built-in memory • 90: file (SD memory card) to built-in memory HA000 to HB400: Cam file read/write command H □□□□ → Target cam No.(1 to 1024) 000 to 400 *: "000" applies to all cam files → Read/write target file • A: File (standard ROM) to built-in memory • B: file (SD memory card) to built-in memory HFFFE: Execution command	
SD860	Sampling settings storage target	Sampling settings storage target	Set the storage target drive for sampling settings data subject to sampling. Read when the "Sampling settings RUN request (SM860)" is ON. 0: Standard ROM 1: SD memory card	

*1 Do not execute the automatic refresh.

*2 This can be set only in VCⅡ series.

MEMO

REVISIONS

* The manual number is given on the bottom left of the back cover.

Revision date	*Manual number	Description
July 2014	IB(NA)-0300237-A	First edition
March 2015	IB(NA)-0300237-B	■Added functions Label access from external devices, File transmission at boot function, Event history function, Optional data monitor function (transient command), Optical hub unit (MR-MV200) connection, Expansion of the number of connections for vision system, Add-on function, Servo amplifier (MR-J4□-B-LL) compatible ■Added or modified parts SAFETY PRECAUTIONS, RELEVANT MANUALS, TERMS, Section 1.3, 2.1, 2.2, 2.3, 2.4, 3.1, 3.9, 4.5, 4.6, 4.7, 4.8, 5.2, 5.3, 5.4, 5.5, 5.6, 6.2, 6.5, 6.7, 6.8, Chapter 8, Section 8.1, 8.5, Chapter 9, Section 9.1, 9.2, 9.3, Appendix 1, 2, 3
June 2015	IB(NA)-0300237-C	■Added or modified parts Terms, Section 1.1, 2.1, 2.4, 4.4, 4.8, 5.2, 5.6, 6.6, 6.8, 7.7, Appendix 1, 2, 3, 4

Japanese manual number: IB-0300236-C

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If any faults or defects (hereinafter "Failure") found to be the responsibility of Mitsubishi occurs during use of the product within the gratis warranty term, the product shall be repaired at no cost via the sales representative or Mitsubishi Service Company.

However, if repairs are required onsite at domestic or overseas location, expenses to send an engineer will be solely at the customer's discretion. Mitsubishi shall not be held responsible for any re-commissioning, maintenance, or testing on-site that involves replacement of the failed module.

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[Gratis Warranty Range]

(1) The range shall be limited to normal use within the usage state, usage methods and usage environment, etc., which follow the conditions and precautions, etc., given in the instruction manual, user's manual and caution labels on the product.

(2) Even within the gratis warranty term, repairs shall be charged for in the following cases.

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4. Failure that could have been avoided if consumable parts (battery, backlight, fuse, etc.) designated in the instruction manual had been correctly serviced or replaced.
5. Failure caused by external irresistible forces such as fires or abnormal voltages, and Failure caused by force majeure such as earthquakes, lightning, wind and water damage.
6. Failure caused by reasons unpredictable by scientific technology standards at time of shipment from Mitsubishi.
7. Any other failure found not to be the responsibility of Mitsubishi or that admitted not to be so by the user.

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(2) Product supply (including repair parts) is not available after production is discontinued.

3. Overseas service

Overseas, repairs shall be accepted by Mitsubishi's local overseas FA Center. Note that the repair conditions at each FA Center may differ.

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5. Changes in product specifications

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IB(NA)-0300237-C(1506)MEE
MODEL: RMT-P-COM-E
MODEL CODE: 1XB004

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